MECHANICAL HANDLING

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EUROPE OR NOT?

As we go to press, a debate has taken place in the House of Commons on our European trade, and consequently much has been said and written about the Common Market countries (six) and the European Free Trade Association (seven). If anyone wants to start a conversation to-day, all one has to do is to mention the Common Market.

Parliament is divided on the subject as to whether or not this country should draw closer politically and economically to Europe, the man-in-the-street is divided on the subject and a certain section, of course, do not care.

As far as we are aware, no trade association connected with the field of mechanical handling has issued any statement on the subject. Speaking to individual persons (executives of firms belonging to one or another of these trade associations) we would say that the majority of British manufacturers of mechanical handling equipment would welcome the opportunity for this country to become a partner in the Common Market. There is another school, not to be ignored, who think that we should turn our attention and our efforts to obtain more trade from Commonwealth countries and markets outside Europe. It is all very well to quote figures that, within the Common Market, is a population of so many millions, but it must be remembered that in the Commonwealth and outside Europe is a potential market for our products of many more millions.

If we turn towards Europe are we not likely to strain our relationship with the Commonwealth? In Africa, for instance, we are witnessing now the birth of several new and independent countries. They will still look to us for leadership and financial help. Should we not concentrate on increasing our trade with them to our mutual advantage, rather than turn towards Europe with all its political divisions? Let us study for a moment the views of two well-known British industrialists. A year or two ago Sir Ivan Stedeford, Chairman of Tube Investments, Ltd., addressing his shareholders, said:

> 'The trend of our trade as between the sterling and European areas again moves somewhat in favour of Europe. We are therefore among those who wait with keen anticipation, mixed perhaps with a little apprehension, the challenge the establishment of the Free Trade Area will offer if it comes about. The last thing this country wants is a trade war with the six Common Market countries. If a compromise becomes possible, as we must hope, our part should be to encourage the European grouping to participate in yet further removals of world-wide obstacles.
>
> 'Whilst developments in Europe attract immediate attention and hopes for the future, it is a simple but important fact that Britain does 80 per cent of her trade with the rest of the world—particularly the Commonwealth and the United States—and this is the trade which is and will continue to be of first importance to the United Kingdom'.

A differing point of view comes from Mr. H. G. Lazell, Chairman of the Beecham Group, who, at the Annual General Meeting of his company, said:

> 'The breakdown of the negotiations for the establishment of a European Free Trade Area to include both the six countries of the Common Market area and the other countries of Europe has faced this country with the need for a reappraisal of its policy towards Europe. It is the view of your Board that the long-term interests of this country and of your company require the widest possible freedom to export and compete on equal terms; and that the development of large-scale competition behind the united tariff wall based on a protected home market of 167 million people will pose a serious threat to British exports in markets outside the Common Market.
>
> 'To join the Common Market at this late stage would no doubt present great problems; but the alternatives to joining it may be most serious for the future of the country'.

Here we have two differing points of view from two first-class leaders of British industry. We must make up our minds which turning to take, otherwise it will be too late and, to use a hackneyed phrase, we shall fall between two stools.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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For readers overseas

SOMMAIRE EN FRANÇAIS

Installation d'embouteillage mécanisée
Par D. M. Potter, B.A.(Oxon). Page 580
A la Brasserie Hope & Anchor, de Sheffield, on vient d'ajouter une nouvelle chaîne de mise en bouteilles au magasin d'embouteillage qui existait déjà. Cet article constitue une étude de trois types de dispositif de manutention mécanique en usage: (a) chariots à fourches et palettes; (b) transporteurs; (c) installation de traitement qui incorpore des éléments mobiles de l'ouvrage.

Le sucre à raison de 500 kilogs à la minute Page 588
Par P. M. Sanders, M.I.Mech.E., M.Ins.T.
Les exigences d'aujourd'hui quant à l'emballage du sucre en poudre et aux conditions dans lesquelles il devrait se faire nécessitent l'application d'un soin minutieux et sévère à tous les stades lorsqu'il s'agit d'une fabrique qui doit fonctionner continuellement à capacité presque totale, avec le minimum d'arrêts, afin d'assurer une grosse production quotidienne. Ceci vaut particulièrement dans le cas de la Station d'Emballage de Wandsworth, de la Tate & Lyle Co., Ltd., station qui manutentionne quelque 203 tonnes par jour, pendant cinq jours de la semaine.

Suspension en caoutchouc pour chariots d'usine et wagonnets de mine Page 597
Cet article décrit un certain nombre de diverses formes de suspension simple, employant des éléments constituants fabriqués par la Metalastic, Ltd. Cet article traite de la forme de monture Metacone, de ressorts 'sandwich', d'ensembles simples double 'U' et de ressorts en caoutchouc liés par chevrons.

Echantillonnage d'activité et arte d'acheminement Page 601
Par T. E. Green, A.M.I.Prod.E., A.M.B.I.M.
Deux problèmes se présentent fréquemment dans la manutention et le transport des matériaux: (1) dispose-t-on d'auxiliaires de manutention mécanique suffisants; et (2) les diverses sections ou divisions d'une usine sont-elles situées relativement les unes aux autres pour qu'il n'y ait que le minimum de déplacement des documents et des marchandises entre les sections? Pour résoudre ces problèmes, il existe deux moyens auxiliaires d'étude et d'analyse, qui sont l'échantillonnage d'activité et la carte d'acheminement. Mr. Green examine ici ces deux moyens auxiliaires.

Commande entièrement automatique des transporteurs d'atelier de peinture dans une usine automobile française Page 606
Par K. Mumby
Un système complexe de transporteurs plus long que tout autre installé en Europe, ayant des moyens d'acheminement automatique et de compensation de vitesse vient d'être installé par les Ets. SIMCA, en leur usine de Poissy, petite ville aux environs de Paris. Ce système a pour but de mettre en oeuvre la politique de cette firme, consistant à offrir à sa clientèle des voitures sur mesures, suivant les désirs individuels, à un prix qui serait normalement demandé pour un véhicule construit à la chaîne.

Les chariots à fourche économisent temps et espace dans un magasin de crème glacée Page 615
Par un rédacteur particulier
Certains des principaux constructeurs anglais de chariots à fourche ont tôt fait de reconnaître tout l'avantage qu'il y aurait à palettiser dans les chambres froides qui se montent rapidement un peu partout. L'auteur décrit le service de chariots à fourche destinés à travailler dans des températures jusqu'à —29°C.

Grues roulantes aériennes à bandages pneumatiques Page 622
Deux ponts roulants aériens électriques montés sur bandages pneumatiques qui, à ce que l'on croit, seraient les premiers de ce genre dans le monde, fonctionnent déjà activement depuis six mois à la Papeterie d'Aylesford appartenant au Reed Paper Group.

Le matériel anglais à l'étranger Page 626
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INHALTSÜBERSICHT AUF DEUTSCH

Mechanisierte Flaschenfüllanlage Seite 580
von D. M. Potter, B.A.(Oxon)
In der Brauerei der Fa. Hope & Anchor in Sheffield wurde das Flaschenlager durch eine neue Flaschenfüllstrasse ergänzt. Im vorliegenden Artikel werden die dort sich dort im Einsatz befindenden Förder- und Hebemittel untersucht und zwar: (a) Gabelstapler und Paletten, (b) Förderanlagen und (c) Verfahrensanlagen unter Einschluss von Vorschubeinheiten.

10 Zentner Zucker pro Minute Seite 588
von P. M. Sanders, M.I.Mech.E., M.Inst.T.
Die heute an die Verpackung von Korn-

zucker und die dabei herrschenden Betriebsverhältnisse gestellten Ansprüche erfordern eine geneue Überwachung in allen Stadien, in denen die Anlagen bei nahezu maximaler Belastung und minimalen Stillstandzeiten kontinuierlich laufen müssen, um einen grossen täglichen Ausstoss zu gewährleisten. Dies gilt besonders für die Verpackungsstation der Fa. Tate & Lyle, Ltd., in Wandsworth, die in einer 5-tägigen Woche täglich etwa 203 t bewältigt.

Gummiaufhängung für Flurfördermittel und Bergwerks-Förderkarren Seite 597
In diesem Artikel wird eine Anzahl verschiedenartiger Federungssysteme unter Anwendung von Bestandteilen beschrieben die von der Fa. Metalastic, Ltd., hergestellt werden. U.a. wird auf das 'Metacone'—Lagerungsverfahren, geschichtete Federn, Doppel-U-Scherteile und pfeilartig verklebte Gummifedern hingewiesen.

Multimomentverfahren und Bewegungsaufzeichnung Seite 601
von T. E. Green, A.M.I.Prod.E., A.M.B.I.M.
Zwei Fragen treten häufig bei der Materialförderung auf: (1) sind genügend Förder- und Hebegeräte vorhanden und (2) sind die verschiedenen Sektionen einer Abteilung bzw. die verschiedenen Abteilungen einer Fabrik derart günstig zu einander angeordnet, dass die jeweils von einer Abteilung zur anderen geschickten Unterlagen und Waren auf dem kürzesten Wege an ihren Bestimmungsort gelangen? Zur Lösung dieser Fragen stehen dem Studium und der Analyse zwei Hilfsmittel zur Verfügung: das Multimomentverfahren und die Bewegungsaufzeichnung. Diese Hilfsmittel werden hier von Mr. Green besprochen.

Vollautomatische Steuerung von Förderanlagen in der Lackierabteilung einer französischen Autofabrik Seite 606
von K. Mumby
Die streckenmässig längste Förderanlage in Europa mit Einrichtungen für automatische Fördergutführung und Geschwindigkeitsausgleich wurde von der SIMCA in ihrem Werk in Poissy, einer kleinen Stadt vor Paris eingebaut. Der Einbau dieser Anlage erfolgte im Zuge der daraufhin ausgehenden Verkaufspolitik der Firma, ihren Kunden zum selben Preise auf Sonderwünsche abgestellte Kraftfahrzeuge zu liefern, der normalerweise für ein serienmässiges Fahrzeug verlangt wird.

Gabelstapler ersparen in einem Speiseeislager Zeit und Raum Seite 615
von einem Sonderberichterstatter
Einige führende britische Gabelstaplerfabrikanten haben schnell die Vorteile erkannt, die sich aus der Palettisierung in den z.Zt. überall auftauchenden Kühllagern ergeben. Der Verfasser beschreibt die Wirkungsweise von Gabelstaplern, die zum Einsatz bei Temperaturen bis fest −30°C konstruiert wurde.

Hängekrane mit Luftbereifung Seite 622
Als wahrscheinlich die ersten ihrer Art in der Welt befinden sich zwei luftbereifte elektrische Hängekrane bereits seit mehr als 6 Monaten in der Papierfabrik Aylesford des Papierkonzerns Reed in intensivem Einsatz.

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SUMARIO EN ESPAÑOL

Planta embotelladora mecanizada Pág. 580
Por D. M. Potter, B.A.(Oxon.)
En la fábrica de cervezas de Hope & Anchor, de Sheffield, ha sido añadida a la sección de botellas una nueva línea de embotellado. En este artículo figura un estudio de los tres tipos de despositivos de manipulación mecánica usados: (a) carretones de horquilla y bandejas; (b) transportadores; (c) plantas de procesar de las que forman parte elementos para el movimiento.

Azúcar a media tonelada por minuto Pág. 588
Por P. M. Sanders, M.I.Mech.E., M.Inst.T.
Los presentes requisitos en el embalaje del azúcar granulado y las condiciones en que tiene que efectuarse exigen un estricto cuidado de todas las estapas, debiendo la instalación funcionar ininterrumpidamente cerca de su capacidad total, con un mínimo de paros, para asegurar un gran rendimiento diario. Dichas condiciones se aplican especialmente a la Estación de Embalaje de Wandsworth de la Tate & Lyle, Ltd., por la que pasan diariamente unas 203 toneladas métricas, en una semana de 5 días.

Suspensión de goma para carretillas industriales y vagonetas de minas Pág. 597
En este artículo se describen un cierto número de formas diferentes de suspensiones flexibles sencillas en las que se hace uso de elementos producidos por Metalastik, Ltd. Vienen indicados la forma de montaje Metacone, los muelles emparedados, las unidades combinadas en doble U y los muelles de goma ligados en zigzag.

Clasificación de movimientos y gráfico de traslación Pág. 601
Por T. E. Green, A.M.I.Prod.E., A.M.B.I.M.
Dos problemas se presentan con frecuencia en la manipulación y transporte de materiales: (1) el relativo a la existencia de suficientes elementos para la manipulación mecánica; (2) el de saber si están las diversas secciones de un departamento, o los diversos departamentos de una fábrica, situados en relación tal entre sí que se requiera el mínimo de movimiento de documentos y mercancías entre las secciones. Para la solución de estos problemas existen dos medios que permiten el estudio y el análisis: la clasificación de movimientos y el gráfico de traslación. De dichos medios trata el Sr. Green.

Control enteramente automático de los transportadores de la sección de pintura en una fábrica de automóviles francesa Pág. 606
Por K. Mumby
Un complejo de transportadores más largo que ningún otro en Europa, con facilidades para el encaminamiento y la compensación de las velocidades automáticos, ha sido instalado por la SIMCA en su fábrica de Poissy, pequeña ciudad de los suburbios de París. Tiene por objeto poner en práctica la política que sigue aquella sociedad con el fin de ofrecer a sus clientes automóviles que satisfagan el gusto y conveniencia de cada uno de ellos y a un precio que normalmente correspondería a un vehículo producido en masa.

Los carretones de horquilla ahorran tiempo y espacio en un almacén de helados
Por un colaborador especial Pág. 615
Algunos de los principales fabricantes británicos de carretones de horquilla han tardado poco en reconocer las ventajas que se consiguen con el uso de un sistema de bandejas en los almacenes frigoríficos que están surgiendo en todas partes. El autor describe el funcionamiento de los carretones de horquilla que se construyen para trabajo en temperaturas que llegan a los −20°F (−29°C).

Grúas puente con neumáticos Pág. 622
Dos grúas puente eléctricas locomóviles, que se cree son las primeras de su clase en el mundo, montadas sobre ruedas con neumáticos, han estado trabajando intensamente desde hace más de seis meses en la Fábrica de Papel de Aylesford del Reed Paper Group.

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D. M. Potter, B.A.(Oxon.)

MECHANIZED BOTTLING PLANT

EXCELLENT LAYOUT AT HOPE & ANCHOR BREWERIES

Fig. 1. Unloading bay showing lorry loaded with empties on pallets with Yale pallet truck ready to off-load

At the Hope & Anchor Brewery, Wadsley Bridge, Sheffield, a new bottling line has been added to the bottling store.

There are a variety of reasons why a bottling plant should be mechanized including, for instance, improved hygiene by the avoidance of handling foodstuffs, higher output, reduction in exhausting manual labour, fewer breakages, lower running costs and a generally superior means of production control in the sense that material does not accumulate at bottlenecks but travels at a uniform speed through all operations. However, it is easy to design such a layout so that it introduces almost as many difficulties as it solves, viz. conveyor lengths which obstruct passage of personnel and transport, the difficulty of changing from one size to another on mechanized plant, and the problem in most premises of avoiding excessive cornering, and so on.

In order to achieve the benefits, the possible handicaps were carefully considered before the management of the Hope & Anchor Breweries, Ltd. (Sheffield) put their plan for a mechanized bottling store into practice. Among the general principles they used may be summarized the following: (1) The conveyor system starts as near as possible to the unloading dock for the incoming empties; (2) The subsequent conveyor arrangement is in a rectangle, but with most of the cornering achieved by the process machines and the centre kept accessible by a bridge over one of the conveyors; (3) Each line is kept continuously on one size of bottle and, indeed, one type of beer, avoiding the time which would be lost in changing over.

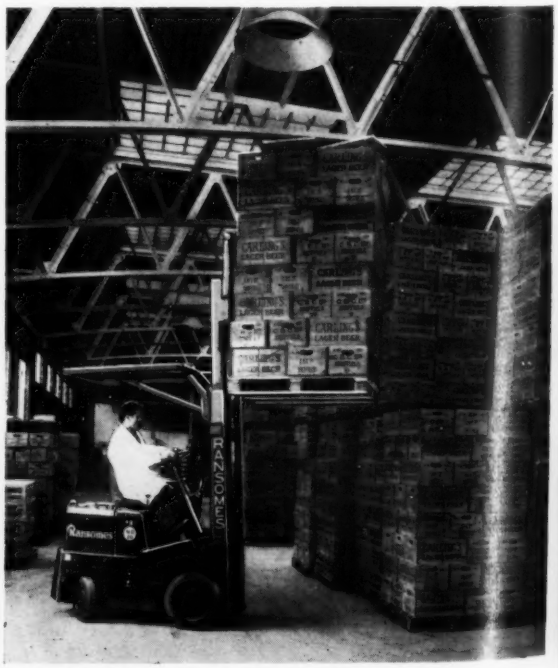
Three independent bottling lines have been put down; but this article is limited to a study of one, the latest, where three types of mechanical handling device are in use: (*a*) Fork trucks and pallets; (*b*) Conveyors; (*c*) Process plant incorporating work-moving members.

The general plan of the total operation is for empty bottles to be received in crates. The bottles are separated from the crates so that the bottles may be washed and refilled and positioned so as to rejoin the empty crates and refill them.

Unloading

Empties arrive in crates stacked on pallets carried by lorry. To unload them the road vehicles are backed up to a dock designed to be at lorry deck height and equipped with a counter-balanced floating ramp to accommodate different deck heights. On to this ramp is run a Yale pallet truck so that it can travel on to the lorry deck and remove the pallets loaded with cases. It is capable of transferring with ease at one lift up to 2 tons, i.e. 100 dozen bottles in cases on their pallets. Battery operated these Yale trucks have been found to be most economical with a 15-hr battery. Where the empties are to be stacked to greater heights a Ransome fork lift truck lifts them two tiers high. Since the softwood pallets are 48 × 40 in in plan and accommodate a standard load of seven boxes on each layer seven layers high, it will

Fig. 2. Empties store showing Ransome, Sims & Jefferies fork lift truck raising 50 cases on a pallet to the top tier of the stack



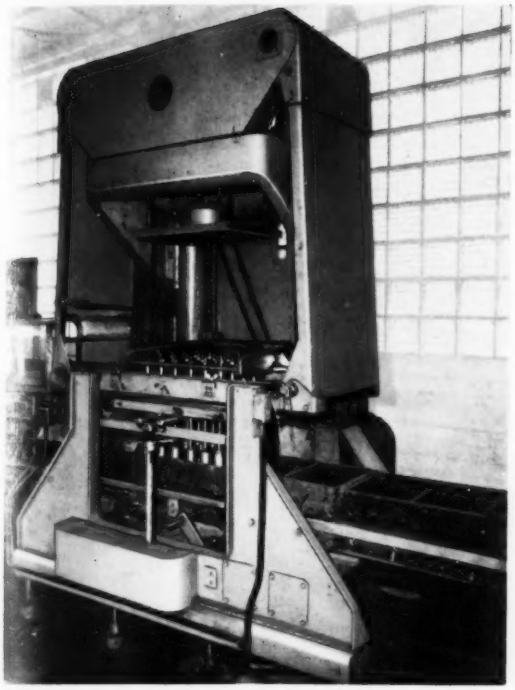


Fig. 3. The ***Hopkins de-crater with the bottle grippers lowered over the bottle necks in a crate of empties***

Fig. 4. The de-crater showing the bottles lifted on to the grid platform for delivery on to washer feed conveyors

be appreciated that a pallet load is 49 cases which in two tiers with two pallets involves a total stacking height of something approaching 12 ft.

Incoming empties in the cases stacked on pallets may be deposited alongside the head of the conveyor system, or they may be temporarily housed in an adjoining Empties Stock. On arrival at the head of the Pantin '600' malleable iron twin-chain conveyor, each case in turn is lifted off the pallet and placed on the conveyor. This leads them into a Hopkins de-crater which has capacity for emptying 1,000 or more cases per hour. The crate passes under a sliding grid through which a set of gripper chucks descend and lift simultaneously all the bottles by the neck through the grid which closes so that the bottles may be dropped on to it; the bottles are pushed off this grid, on to a Renold stainless steel slat conveyor while the emptied crates travel along below on the Pantin chain conveyor.

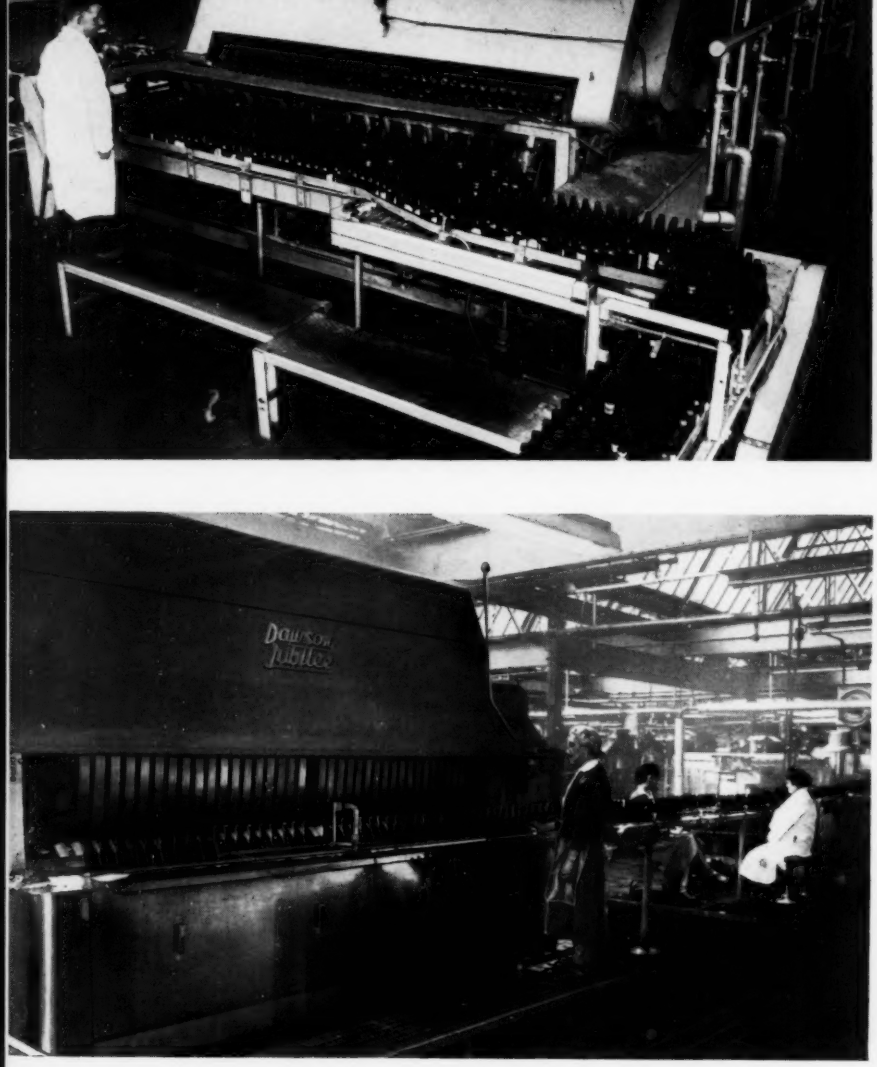
Fig. 5. Washer feed conveyors leaving de-crater on the right and delivering to the washer on the left

Washing and Bottling Circuit

On the Renold slat conveyor, after an intermediate span on a four-wide Pantin chain conveyor, the empty bottles travel five abreast to the washing machine, passing through an aperture in the wall which separates the unloading area from the bottling hall proper. The washing machine is a Dawson 'Soaker Hydro'. To enter it the bottles as they leave the conveyors are accumulated on a wide apron which arranges them in columns for gently tipping over by a claw and toggle device into carriers attached to an endless chain belt. While secured in this way to the chain the bottles are conveyed through a course with no less than five 'U'-shaped movements, each of which is a dip in separate tanks of different washing fluids. Finally at the exit side of the machine the bottles are ejected again gently on to a tipping shelf which finally delivers them upright on to two transverse Renold slat conveyors—again of stainless steel.

These conveyors take the bottles two abreast to a point where each column of bottles can pass along a lighted screen for 'sighting' or visual inspection purposes.

Immediately after this the filling and crowning (capping) takes place in a Meyer machine. From a mechanical handling viewpoint the main interest of this operation is that the bottles are re-aligned on the approach conveyor into a single column and then taken through the operation on the filler by being stationed on a rotary table which expels them at right angles to the route at which they entered. The beer is pumped from large storage tanks in a neighbouring



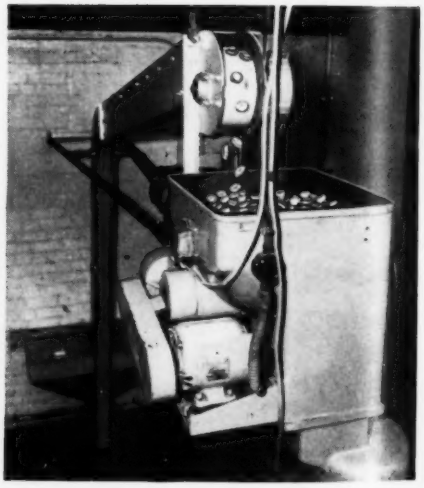


Fig. 6. The rear of the Dawson washer showing bottles accumulating on the infeed conveyors for picking up in the bottle cups which carry them through washing processes

Fig. 7. On the left the bottles are leaving the washer in two lines which take them past the inspection station in the centre, to the filler on the right

Fig. 8. The filler showing bottles leaving at right angles on their way to the pasteurizer in the background; the magnetic hopper feeder (Robson) for delivering crown corks to the filler is overhead on the left

Fig. 9. The Robson magnetic conveyor dropping the steel-backed crown corks into the filler hopper

tankroom, so that all that it is possible to see of the beer in the bottling room is when it leaves the bottling machine in the closed bottles. The closure is secured by crown corks (steel caps, cork lined) which are delivered to the filling machine on an independent Robson magnetic conveyor which picks them up and carries them vertically and then overhead.

The bottle filler and 'crowner' used for this operation is a Meyer which deals with no less than 420 bottles/min.

From the bottle filler work is taken away by a short Renold stainless steel slate conveyor at right angles to that which feeds the filler. This delivers to a Meyer liquid pasteurizer.

At the entry point to the latter the Renold conveyor terminates in a very effective means of making the bottles turn round a right-angle bend. This is a small turntable on to which the bottles are carried by the momentum of

those behind, being prevented from falling off by a radiused rail. The driven turntable takes them round the corner to a point where they are pushed off by a blade which diverts them on to another stainless steel slat conveyor running transversely across the rear of the pasteurizer where the accumulation of bottles against a rail forces the forward bottles on to the pasteurizer belt.

In fact this pasteurizer consists mainly of a giant conveyor 65 ft long and 15 ft wide within a sheet steel casing which also keeps under cover hot water spray and heating devices for maintaining the interior of the machine at a temperature of 150 deg F at the centre tapering to 65 deg F at the exit. The belt inside the pasteurizer is again of stainless steel slats being in two strands making up the 15 ft of width.

On leaving the pasteurizer approximately 75 abreast the bottles are crowded off five abreast on to a transverse Renold slat conveyor which by means of a turntable (similar to that at the entry side) diverts the bottles to a longitudinal course again; i.e. in line with the direction of travel on the pasteurizer belt.

The 'Filing' Table

After a few feet the conveyor delivers the bottles on to what is referred to as a 'filing table'—a rotating table which again takes the bottles round a right-angle bend but in this case separates them into two single-file columns as they are deflected off on to two independent conveyors. The latter are again of the Renold stainless slat type, each travelling to a separate 'Cyclone' labeller made by Morgan Forest, Ltd.

Two further Renold slat conveyors take the now fully bottled and labelled beer io the crating station. Here the bottles are hand-fed into the empty crates which travel through in two lines on the Pantin conveyor coming straight from the initial operation at the de-crater. A clever device allows the two lines of re-filled crates to combine: it is a Pantin 'combiner' or 'policeman' which places a retarder arm in front of one line of cases while one case moves forward on the other, alternating from one line to the other as the front case travels onwards.

The filled cases are now on a roller conveyor with speed control effected by a driven belt in contact with the underside of the rollers. This carries them to the floor below to the semi-automatic palletizer.

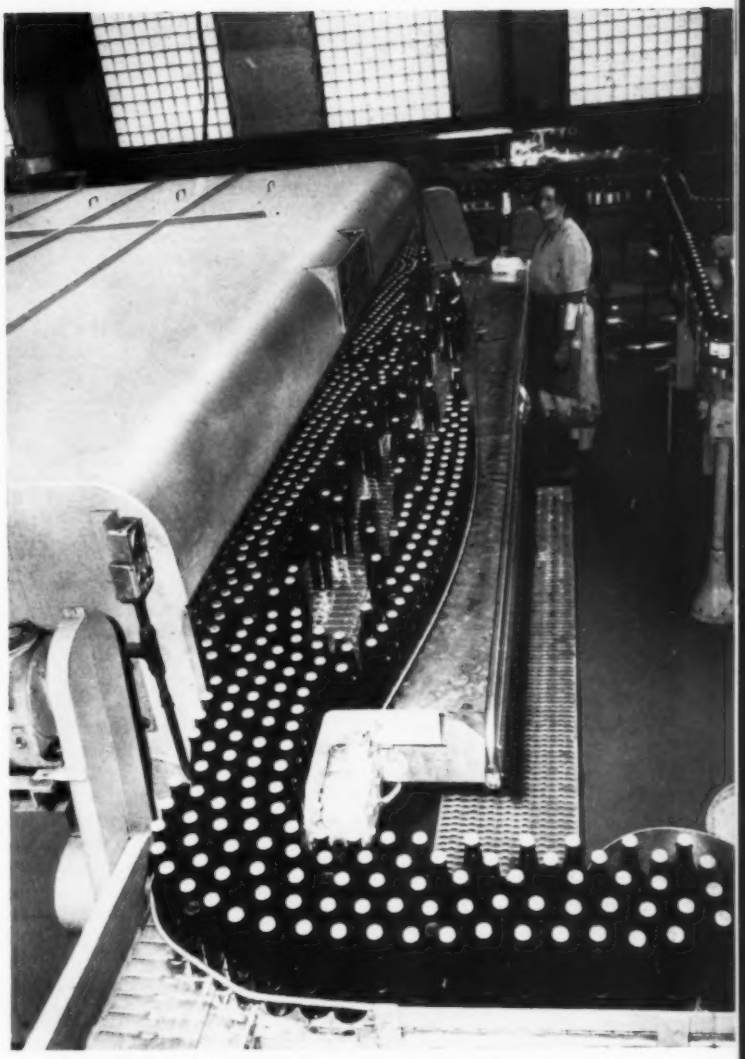


Fig. 12. Bottles leaving the pasteurizer 72 abreast and accumulating on the transverse conveyor 5 abreast

Fig. 10. Bottles feeding into pasteurizer making a right-angle turn on the driven turntable

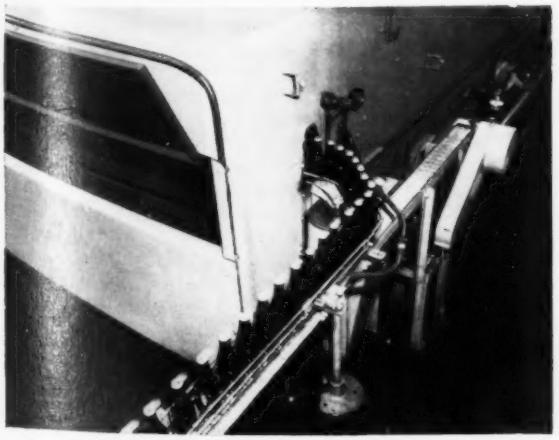
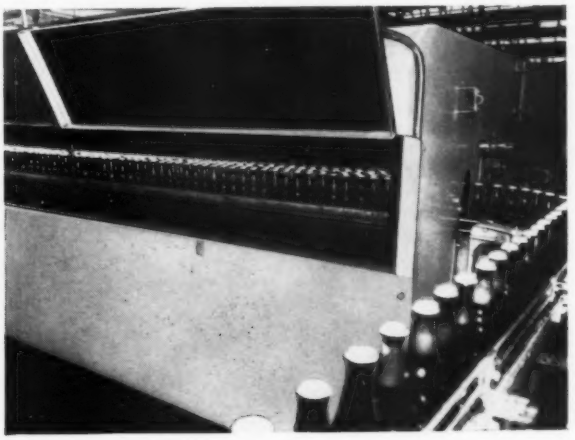


Fig. 11. Bottles in pasteurizer on the twin carrier bar conveyors accommodating 72 abreast



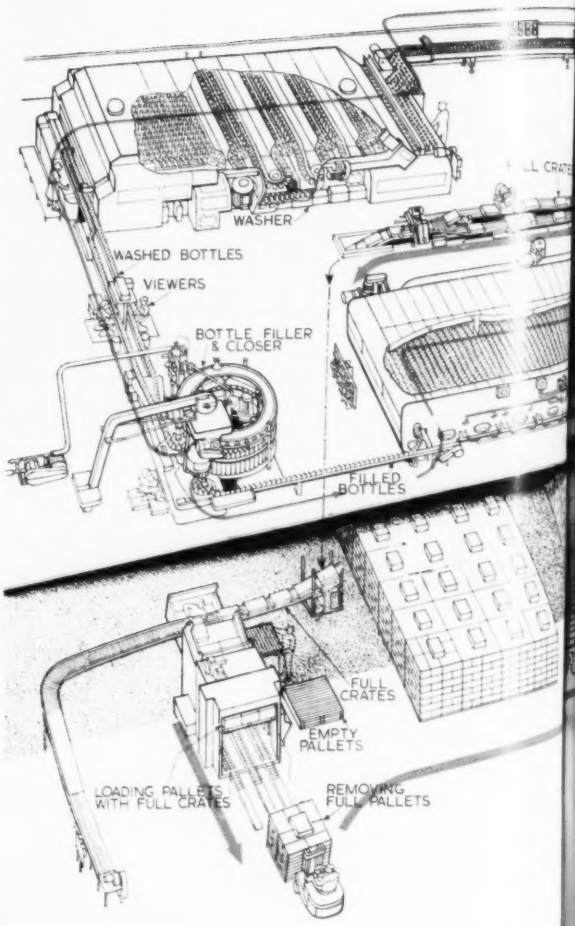
The Palletizer

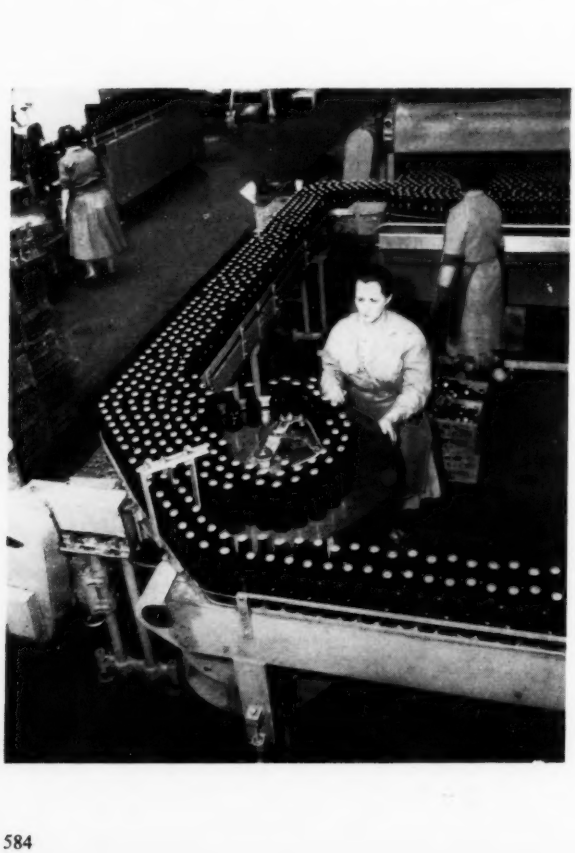
The semi-automatic palletizer is a most interesting and effective appliance made by Rose Brothers (Gainsborough), Ltd. At Hope & Anchor Brewery it is used to stack the cases of finished bottled beer on wooden pallets, so that there are 49 cases on each 48 × 40 in pallet.

An operator stands on an elevated platform on to which he receives the filled cases by roller conveyor. He guides 7 cases/layer by hand from the conveyor on to a stripper plate which has been lifted to the same level by an electrically driven twin screwelevator. When one layer is complete the operator starts the automatic cycle by a foot switch. The stripper plate is withdrawn by a pneumatic piston, lowering the layer of cases on to the pallet immediately underneath. The elevator with pallet and cases descends the distance of one layer and the stripper plate is returned over the top of this first layer of crates so that the operator can load it again and repeat the process until the seventh layer. The full pallet is now at ground level and automatically ejected from the palletizer by a horizontal motor-operated pusher, which propels it on to an inclined roller track. At the end of this are stops so aligned that a fork truck can easily approach and remove the full pallet on its forks. The same action providing the ejection of the full pallet causes an empty one to be placed on the elevator at the bottom station, from which it is then automatically lifted to the top position through a trip switch system bringing the elevator motor into operation.

The cycle can be preset for automatic or hand working on a control console alongside the palletizer and the whole sequence of operations works very smoothly dealing with no less than 16,000 dozen bottles (8,024 cases) /day from this one line of ½-pint Jubilee Stout bottling units.

The fork lift truck is a Lansing Bagnall and each pallet load weighs approximately 1 ton, being 48 × 40 in in plan and 6 ft high. The fork lift truck picks up the loaded pallets and stacks them two high, that is so that the top is





LEFT
Fig. 13. *Filing table dividing bottles into two lanes for labelling*

12 ft from the ground—the limitation being the ceiling level.

To load the outgoing road vehicles over the floating ramp and the despatch dock, the fork trucks run straight on to the lorry decking and put down the stack of cased bottles, leaving them on the pallets.

Economics of the Installation

(*a*) Palletizing. In a lecture to the Sir John Cass College five years ago Mr. W. E. Bird (director of Hope & Anchor Breweries, Ltd.) described some of the advantages obtained by the use of pallets. He referred to the problem to be faced at that time: 'When we began to investigate the possibilities of palletizing, the number of men employed on handling both full and empty cases was 28—eight men engaged in the empties section and 20 loading full cases—working in two shifts. It was found that the afternoon shift actually handled up to 100 tons/man, remembering the number of times one case might be handled in arriving on the vehicle platform. It took five men ½ hr to load 1,200 dozen on to one lorry'.

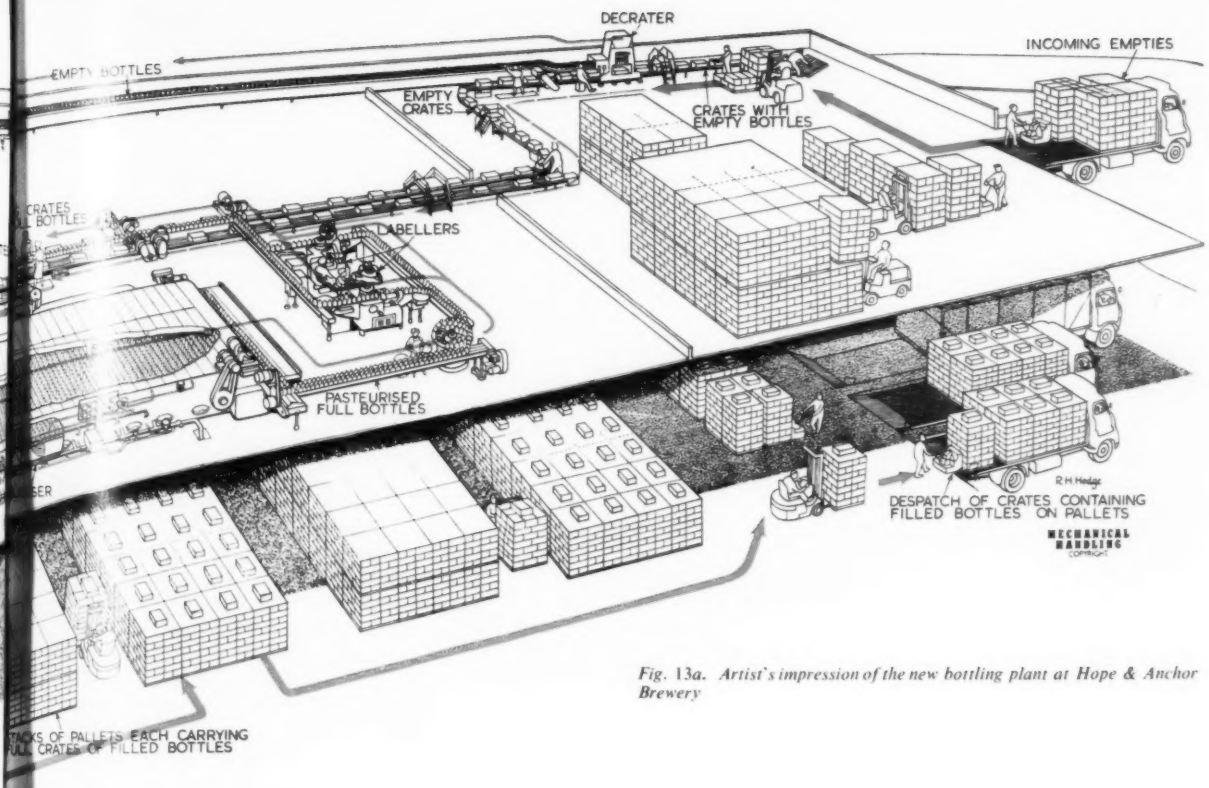


Fig. 13a. Artist's impression of the new bottling plant at Hope & Anchor Brewery

He then went on to describe some of the results then achieved by palletizing: 'In place of five men taking ½ hr to load a 12-ton lorry we now find that two men with pallet trucks can do the same job in half the time without any apparent effort—and without breakages which, as you know, can occur every time a case is handled. In fact, breakages have been nil since the manhandling was cut down. What are the advantages of the system we have adopted? In the first place consider the saving in labour. At today's rates of pay about £7,000 a year has been saved on this item. The labour force has been cut down by 50 per cent, from 28 to 14 men, amounting to a saving of 30,800 man-hrs/year. That also means 50 per cent less headaches! We saved an estimated amount of £1,500 cash on bottles broken in the empties section and in the full storage, leakages and broken cases. This figure may seem high—but remember that on the old system the cases were manhandled anything up to 10 times, very often not gently, while on the new system they are manhandled twice only. Pilferages now are nil—supervision is easy, and stocktaking simple. Strange as it may seem, the actual sum saved in one year, £8,500, is the actual amount of the capital laid down in the new scheme, so that we have already reaped the benefits of that capital expenditure. We are also saving on electricity costs. With the 13 3-h.p. electric motors on the old system the running cost at 1d./unit was 3s. 3d./hr. We now have to charge the batteries for the pallet trucks, and the nine trucks, running continuously, would cost 1s. 3d./hr—showing a saving of 2s./hr. On a 12-hr day and five-day week, this shows a saving of £6 per week with electricity at 1d. /unit.'

Since the date of Mr. Bird's lecture, the palletizer has been installed in the 'full' store. As a result manhandling has been further reduced and the output per man has greatly increased with the much larger turnover of the bottling hall.

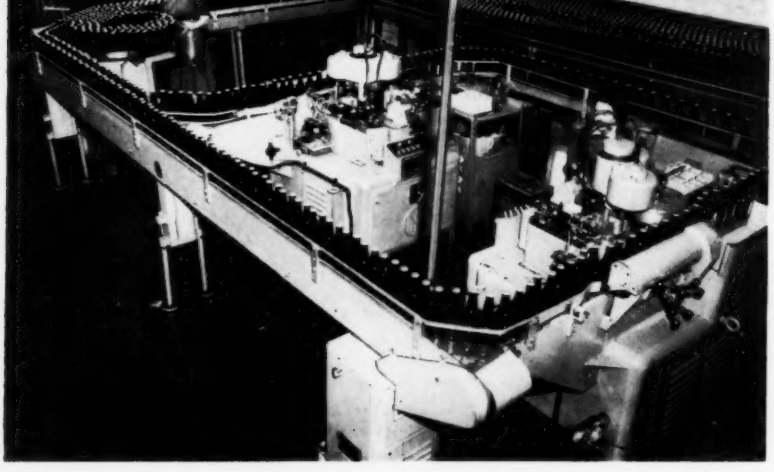
(*b*) Bottling. In the bottling hall itself the new bottling line has also resulted in considerable changes in handling, staffing, running costs and production speeds.

'Skid and crowd' methods

For the benefit of those who see conveyors in use for other purposes it may be of interest to note a peculiarity of the type of conveyor system installed in some bottling halls. A first essential is that the object being conveyed should be capable of skidding on the conveyor. Consequently both work and conveyor have to be relatively smooth, the latter avoiding anything in the nature of a claw device which would haul the work along. In fact the stainless steel Renold slat conveyors are sufficiently smooth and the bottle bases so polished that the conveyors continue to travel whether the bottles are held up or otherwise. The conveyors skid under the bottles if there is a stoppage; on the other hand there is just sufficient friction between the conveyor and the bottles to carry the latter forward on the conveyors when the bottles are not obstructed.

Although it would seem unlikely, the same practice is followed with the wooden cases on the malleable iron Pantin chain conveyor. It might be thought that the iron chain could not skid under the wooden boxes if the latter are held up; but presumably through clever design of the links, lubrication and other means, no difficulty is experienced in this respect and it is possible to push with one hand half a dozen cases back against the pull of the conveyor.

Allied to this skid practice on the conveyors is another interesting detail. In order to feed bottles on and off the aprons of the various machines—and also to change direction and change from single to multi files and vice versa—a method is used which for want of a better term may be called 'crowding'. The bottles accumulated in a



ABOVE
Fig. 14. The two 'Cyclone' labellers with bottles entering from the left and leaving to the right

BELOW
Fig. 15. General view of the rear of the pasteurizer, filing table and labellers

Fig. 16. Bottle packing, showing the Pantin chain, driven-roller and chain conveyors

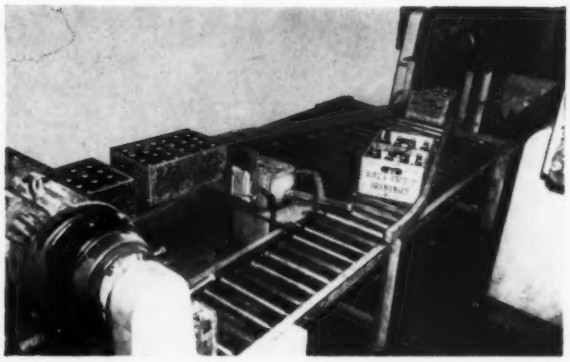


Fig. 17. Filled cases leaving packing through case 'combiner' which allows cases from one of the two conveyors to proceed. The roller conveyors are driven by a belt on the underside

crowd under this skid delivery arrangement eventually push the forward bottles off the conveyor or apron on to the next stages of transit.

In the planning of this layout considerable thought had obviously to be given to the consumption rates of the machines, the linear speeds of their internal feeding devices and the number abreast in each flow stream. For instance the feed into the pasteurizer is in single-file, but the bottles travel through the machine approximately 75 abreast. If the linear speed of the pasteurizer belt were the same as the incoming feed belt the machine would be nearly empty; consequently the feed conveyor must travel roughly 75 times faster than the pasteurizer belt. Equally if the exit belt were at the same speed as the pasteurizer belt the former would be overwhelmed, so it takes the bottles five abreast at a linear speed of 15 ft/min. It is partly for this reason that the bottles appear to accumulate and then be absorbed on the flow-line, although the total progress is no doubt at a uniform speed. This in its turn shows how useful is the 'skid and crowd' method of feeding.

While these are details of practice it is interesting to compare them with other conveyor methods where each item of work is individually hauled. It is possible to see the advantages of elasticity of work flow provided by the Hope & Anchor method, no doubt assisting the vast throughput of 192,000 items/shift along each conveyor. Equally it obviously greatly assists in reducing breakages when a stoppage occurs.

BELOW

Fig. 18. 'Full' store, showing palletizer. The filled cases arrive on the elevated conveyor at the rear and are accumulated on the pallet shown in the machine

Conclusion

It is quite clear that at Hope & Anchor Brewery the material movement has been scientifically studied and by progressive stages most efficient methods have been evolved incorporating a balanced use of direct loading on and off road vehicles, palletizing with fork trucks, conveyorizing and process machines incorporating automatic work handling devices. This demonstrably provides much improved efficiency and, through greater hygiene, better beer.

Acknowledgment

We would like to express appreciation to the directors of Hope & Anchor Brewery, Ltd., for permission to secure and publish these data and also Mr. W. Eric Bird (director) and Mr. T. E. Moody (chief engineer) for providing the necessary information.

LEFT

Fig. 19. Complete pallet load in course of removal by the Lansing Bagnall fork lift truck for storage in 'full' store. A new pallet is being inserted in the pallet magazine from the side, while the pallet in the body of the palletizer is being loaded

P. M. Sanders, M.I.Mech.E., M.Inst.T.

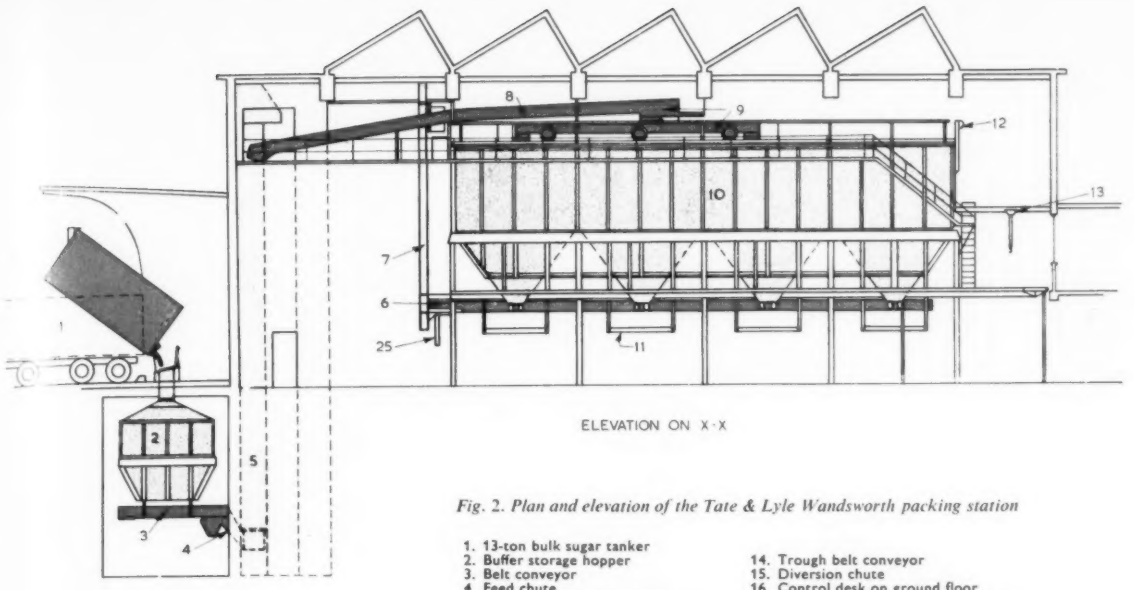
SUGAR AT 10 HUNDREDWEIGHT A MINUTE

Automatic Packaging and Parcelling at the Wandsworth Station of Tate & Lyle, Ltd.

PRESENT-DAY requirements of granulated sugar packaging and the conditions under which it should be conducted call for unremitted strict attention at all stages where the plant must be run continuously at near capacity with a minimum of stoppages to ensure a large daily output. This applies particularly to the Wandsworth packing station of Tate & Lyle, Ltd., which has been in operation since March, 1958, handling about 200 tons daily in a five-day week. Its activities are devoted exclusively to the production of the familiar 2-lb double bags of granulated sugar, having a blue inner lining and two tabs on the top closure of the white outer cover with printed instructions to lift and cut off one in order to pour out the contents. Other forms of packs are handled at the company's refineries at Silvertown and Liverpool and another packing station at Keynsham, near Bristol.

Situated at Wandle Wharf, the Wandsworth station consists mainly of the packaging and parcelling department, having a floor area measuring about 140 × 60 ft. Adjoining it are the despatch department, with road vehicle loading bay, a packaging paper and gum store, boiler house and, at first floor level, the administrative offices, maintenance workshops and canteens. Throughout the whole process, from reception of the sugar to its despatch, it is untouched by hand, and strict precautions are enforced against risks of contamination and fire. No smoking or partaking of meals

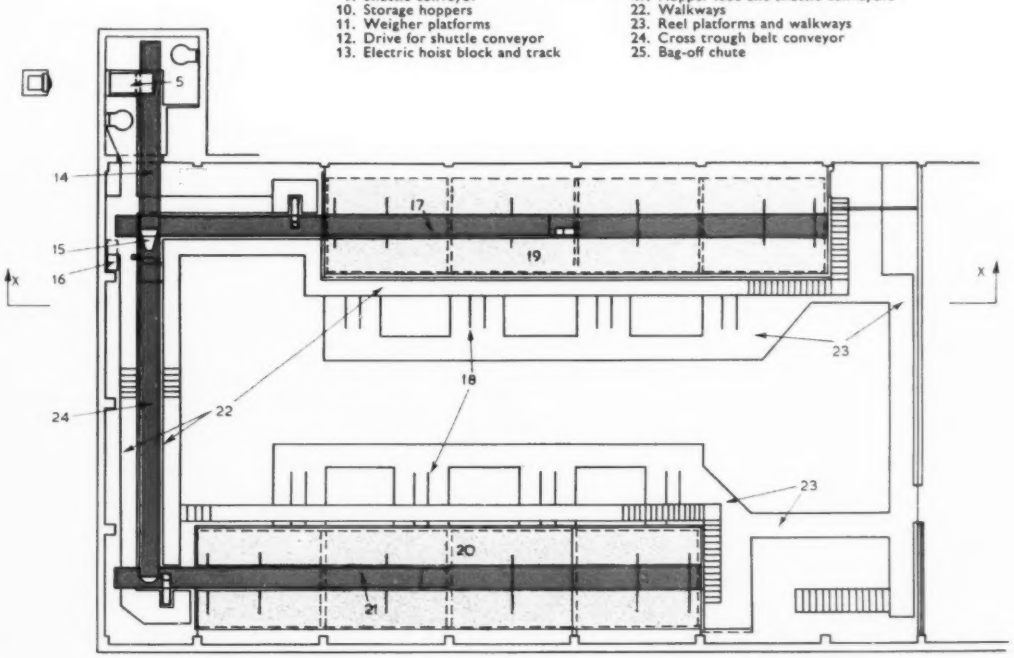
Fig. 1. *General view of the packaging department, from the southern end*



ELEVATION ON X-X

Fig. 2. Plan and elevation of the Tate & Lyle Wandsworth packing station

1. 13-ton bulk sugar tanker
2. Buffer storage hopper
3. Belt conveyor
4. Feed chute
5. Chain and bucket conveyor
6. Trough belt recirculating conveyor
7. Belt and bucket elevator
8. Hopper feed trough belt conveyor
9. Shuttle conveyor
10. Storage hoppers
11. Weigher platforms
12. Drive for shuttle conveyor
13. Electric hoist block and track
14. Trough belt conveyor
15. Diversion chute
16. Control desk on ground floor
17. Hopper feed and shuttle conveyors
18. Packaging paper reel stands
19. Western storage hoppers
20. Eastern storage hoppers
21. Hopper feed and shuttle conveyors
22. Walkways
23. Reel platforms and walkways
24. Cross trough belt conveyor
25. Bag-off chute



PLAN VIEW

by the workers in the packaging department is permitted. Frequent cleaning is also necessary on account of the sugar dust which settles on the floor and machinery, and for this purpose vacuum equipment is being installed. Heating equipment also maintains an air temperature that avoids caking of the sugar.

General layout

The whole of the conveyor, elevating and storage equipment by which the sugar is fed under automatic or manual control and delivered to the despatch department is electrically operated, arranged and installed by Rownsons (Conveyors), Ltd. This company also erected the whole system of access walkways, platforms and stairways. The ground floor layout is planned to give two lines of identical packaging and parcelling plant along the eastern and western sides of the building, both feeding at the northern end on to a single conveyor leading at right angles out to the despatch department on the east side.

Installed in line at floor level on each side are four Hesser type PDHIII packaging and filling machines, manufactured by Fr. Hesser, Maschinenfabrik Aktiengesellschaft, and

ABOVE
Fig. 3. Looking down on the paper reel platforms above the Hesser packaging and filling machines, with the four eastern storage hoppers in the background

BELOW
Fig. 4. The first operation. An end-tipping road tanker discharging sugar into the underground buffer storage hopper

handled in this country by Jahn (Maskiner), Ltd. Mounted above each machine on a suspended platform are two twin-scale roller-feed double-beam automatic weighing machines, by Geo. Driver & Sons. Through these, sugar is fed to the machine from a Rownsons rectangular hopper measuring 20 ft high × 16 ft × 14 ft. The four hoppers in each line are fed from a Rownsons selective conveyor system installed on a platform about 30 ft above floor level.

From the packaging machines the filled and sealed bags are transferred by hand on to two intermittent tray conveyors manufactured by Gimson & Co. (Leicester), Ltd., and fed to two Hesser type WXO parcelling machines. The wrapped parcels are finally directed on to a single belt conveyor and carried to the despatch department. All the Rownsons conveyors have white food-quality rayon and cotton belts with top and bottom covers, and run over plastic idlers fitted with Permaseal ball bearings, and all steel containers are zinc-sprayed.

Sugar feeding system

The sugar is brought in bulk from the refineries in 13-ton end-tipping road tankers and tipped directly into an underground buffer storage hopper at the south-west corner of the building. The hopper is of 21 tons capacity, lined with Plymax and fitted with a hinged cover, air outlet and inspection door. Through two 8-in square outlet valves the sugar is fed on to a 24-in conveyor, having side skirting to prevent spillage and a whale-bone cleaning brush, and from this is directed by a steel chute to a vertical chain and bucket elevator, of 50 ton/hr capacity, feeding on to a 24-in trough belt fitted with cleaning brush and leading to a bifurcated diversion chute. By a power-operated flap valve it can be directed either at right angles on to the conveyor system feeding the western line of hoppers, or straight on to a brush-cleaned trough belt that takes it across to the conveyors above the hoppers on the eastern side.

Fig. 5 (Above) One of the Rownson selective conveyor installations with shuttle conveyor that is traversed to feed the hoppers below. On the right is the manual control panel

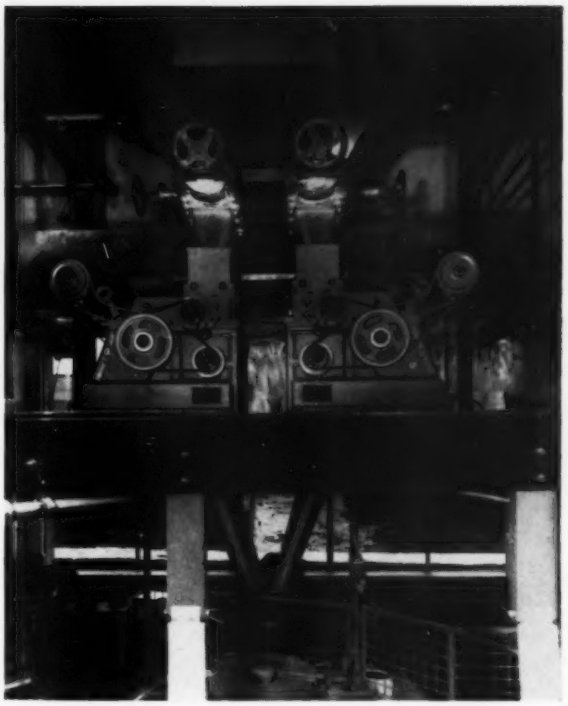
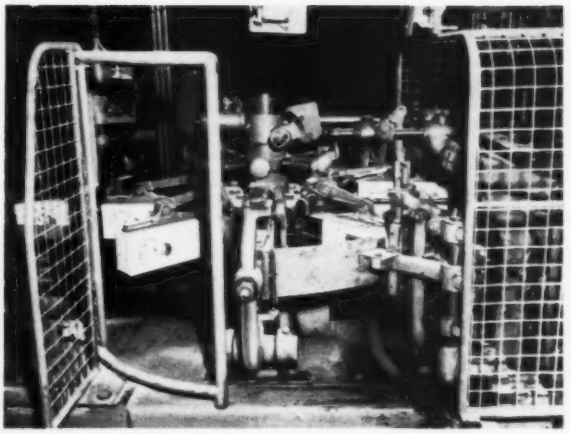


Fig. 6 (Right) Two of the Driver automatic weighers with four chutes through which sugar from the hopper above is fed into the funnel of the bag-filling wheel of the Hesser packaging machine

Fig. 7 (Below right) Bag-forming turret of the Hesser packaging machine, showing location of the white outer covers

Fig. 8 (Below) Bag-filling wheel of a Hesser packaging machine, showing the four chutes through which sugar from the weighers is directed into the filling funnel



Each of the hopper-feeding systems consists of a 24-in trough belt conveyor delivering on to a 24-in trough belt reversible-shuttle conveyor mounted on flanged wheels to run on a track above the hoppers. Operated by a fan-cooled motor through worm reduction gear and chain, the shuttle conveyor is fitted with a cable reeling drum and, by means of traversing gear, consisting of a separate motor, chain drive and system of wire ropes, drums and sheaves, can be moved in either direction. It has two outlet chutes, spaced so that they can be aligned to feed either the first and third or second and fourth hoppers. Limit switches fitted to the track position the conveyor as required and also limit the travel. High-level probes in the chute cut off the feed should a hopper over-fill.

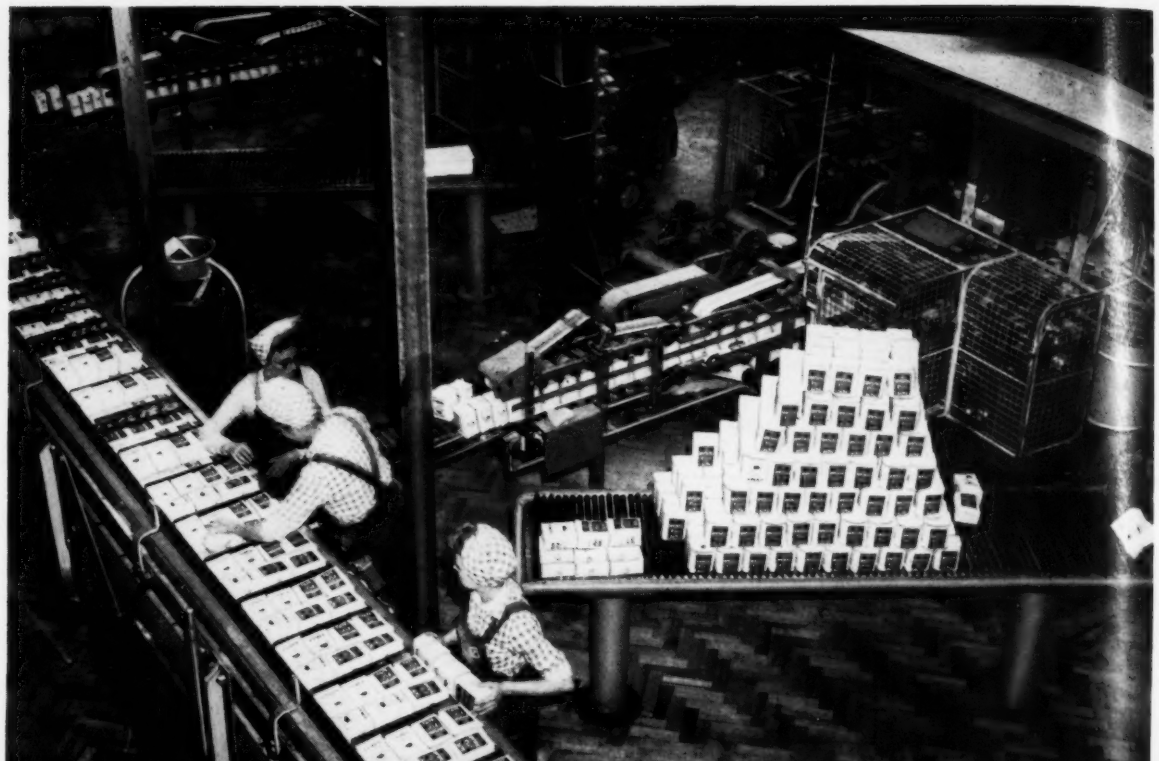
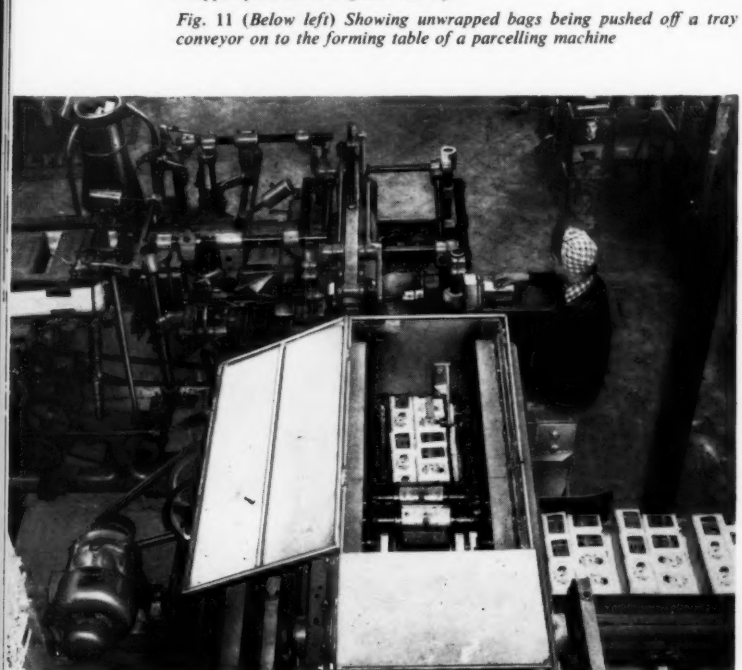


Fig. 9. Filled bags being transferred from a packaging machine and storage table and arranged in assemblies of 14 on an intermittent tray conveyor taking them to the parcelling machine

Fig. 10 (Below right) Hesser parcelling machine in the eastern line. Unwrapped bag assemblies are seen entering the machine on the right and wrapped parcels leaving it on the left

Fig. 11 (Below left) Showing unwrapped bags being pushed off a tray conveyor on to the forming table of a parcelling machine

Each hopper is of 50 tons capacity. It is constructed from Plymax panels and rolled steel sections. Inside, all screw heads at the joints are covered with Plymax beading. There are four outlet chutes fitted with 6-in square valves, two directing the sugar to the four weighers below, and the other two on to a 12-in trough belt recirculating conveyor of 10 ton/hr capacity. The latter is used when it is desired to empty one or more of the hoppers for cleaning or re-filling to prevent consolidation of the sugar if undisturbed for a long period. It is fitted with a bifurcated chute and delivers either to a vertical belt and bucket elevator of 10 tons/hr capacity, which returns it to the conveyor feeding the shuttle



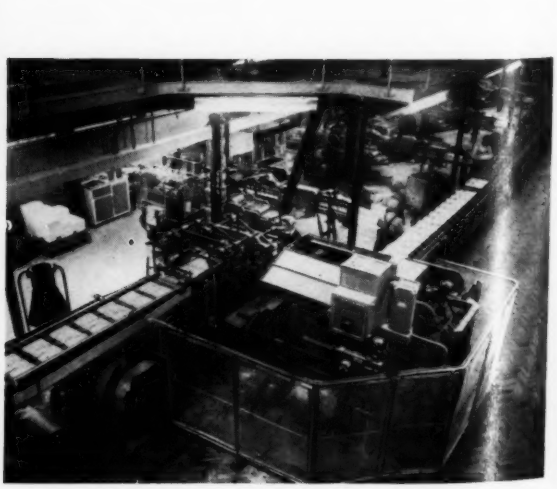
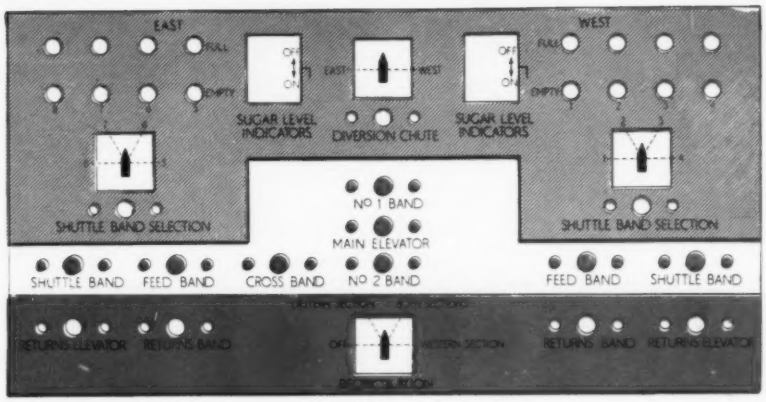


Fig. 12. Layout of the control desk panel of the Rowntrees sugar-feeding plant



conveyor, or to a bagging-off chute with outlet valve operated by hand chain from the ground floor.

At the bottom the outlet chutes of the shuttle conveyor are divided to form inverted V-shaped arches through which is passed over rollers a flat belt that normally closes the top openings of the hoppers. As the conveyor is traversed, a portion of the belt is raised by each chute when it is moved to a filling position, thus automatically affording clear entry for the sugar into the hopper below, but falling again to close the opening as the conveyor is moved to another position. Each hopper is fitted with an inspection door and high- and low-level indicator probes.

Fig. 13 The indicating contro desk

Operational control

The whole of the sugar-feeding plant operations are controlled and indicated by an Allen West control desk on the ground floor. This is fitted with a panel carrying switches controlling the entire system, and indicating lamps showing the filling conditions of the hoppers and which of the conveyors and elevators are in or out of action. Those in the centre of the panel relate to the equipment affecting equally the operations of the east and west installations, whilst those on either side are confined respectively to the condition and operation of the east and west sections. It is thus possible at any moment not only to see the functional state of the whole plant, but to effect such changes as may be necessary.

The central switch and start and stop push-button controls either the east or west diversion chute, and either or both recirculation conveyors can be brought into operation. Those at the sides control respectively the selective movements of the two shuttle conveyors and indicator lamps showing whether the feed hoppers are full or empty. Independent control panels on the hopper-feeding conveyor platforms permit an operator to empty or fill the hoppers to meet special requirements. He can, for example, traverse a conveyor a short distance to and fro over any hopper to fill it more completely than is the case when the flow is held central.

Weighing and packaging

The electrically operated Driver automatic weighing machines are of the H.W. type, employing two weighing beams, one above the other. The upper beams account for 90 per cent of the total weight by coarse feed, which it then deposits into the lower beam where the contents are brought to the exact weight by fine feed and discharged to the packaging and bag-filling machine below.

The brown Kraft parcelling paper and blue packaging paper are supplied from the same store on the ground floor. In an adjoining compartment is the gum-mixing plant, consisting of two mixers which are operated singly in turn. The gum is drawn off into cans in which it is taken by the packaging and parcelling machine attendants as required. The blue paper rolls are elevated by an electric hoist on to a walkway from which they are rolled on to platforms above the packaging machines and there mounted on stands to replace those expended.

Fig. 14. High- and low-level power-operated slat bends and pneumatically controlled roller conveyors feeding wrapped parcels from the eastern and western lines alternatively on to a single conveyor for delivery to the despatch department

As the blue paper is fed towards one of the mandrels of the bag-forming turret of the packaging machine, each bag section is glued, date-stamped and cut off to size. When the side and bottom have been folded, the turret is rotated to bring the mandrel in position for the white outer wrap to be added. The latter, pre-printed and cut to size, is fed from a magazine by a vacuum lifter. The completed open-ended bag is uprighted and transferred to the filling wheel which rotates and positions each bag under a filling funnel into which are directed four filling chutes, each delivering in succession 2 lb of sugar from the weigher.

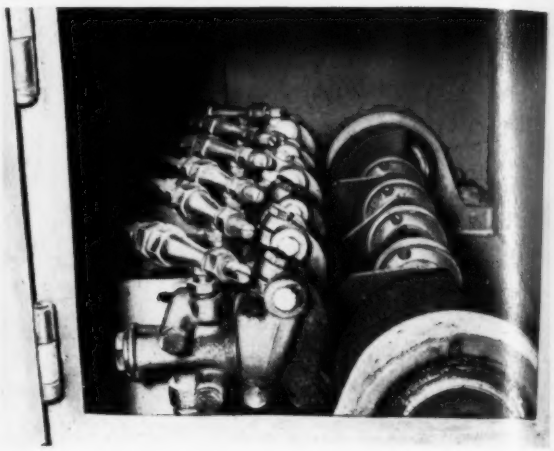
As it is moved into the filling position, the outer side of each bag operates a trigger switch controlling a distributor which in turn controls deliveries from the weigher. Should any of the 12 filling positions on the wheel not contain a bag, the switch is not operated and no sugar is delivered at the vacant position. After their contents are pressed to the right level, the filled bags are ejected on to a sealing wheel where the tops are folded and glue applied for the inner seal and for the tabs which are then folded and pressed down. The bags then pass on to a conveyor where the tops are held down by a belt running continuously under metal rollers. The machines are run to give an output of 64 bags/min.

Parcel wrapping

As they emerge from the four packaging machines in the east and west lines, the bags are transferred by hand on to two tray conveyors that take them to the Hesser parcelling machines. These conveyors are fitted with full-width cross plates, forming a continuous line of open-ended trays of a length, width and depth to accept assemblies of 14 bags in two layers of seven. The bottom layers are placed in the trays by attendants at the first two machines, and the next two add the upper layers.

Alongside each packaging machine is a roller-topped storage table. When a tray conveyor is halted for any reason, the bags received from the packaging machines on the same side are stacked temporarily on the tables and loaded on to the conveyor when it is re-started so that the output of the plant is uninterrupted.

Fig. 15. Cam-operated pneumatic valves controlling two Rownsons alternate delivery roller conveyors



Each parcelling machine and the conveyor feeding it is operated by a 7½-h.p. electric motor, the speed of which can be raised as may be required to accelerate the working of the plant following a temporary stoppage. As each assembly of 14 bags is fed into the parcelling machine, it is moved out of its tray at right angles towards the wrapping table by one of a pair of pusher plates carried between two continously running chains. To permit this, the conveyor is stopped until each tray is cleared. Intermittent running of the conveyor is accomplished by Geneva stop and start mechanism in the drive. The final drive chain sprocket is not keyed to its shaft but tightened on to it by setscrews, allowing relative movement to avoid serious damage to the driving mechanism in the event of sudden stoppage as may be caused by obstruction. The parcelling machine and conveyor are started and stopped by a clutch under hand lever control by the attendant.

As the wrapping paper is fed from a reel at one end of the parcelling machine to the wrapping end, each sheet length is glued for sealing, and on the outer surface are printed the company's name, number of bags contained and a code showing the date and which machine wrapped the parcel. Each sheet is cut off by a guillotine and moved into position above the wrapping table on to which the bag assemblies are moved in succession by the pusher plates. Each assembly is raised by the table under the paper sheet which at the same time is folded down on the sides and then folded under by a rising plate. The bags are consolidated and correctly positioned by a pair of pressure plates operated horizontally through the open ends of the wrappings. The parcel is then pushed off the table, and as it is moved the open ends are folded. Further movement is on a cotton belt conveyor where sealing pressure is maintained on the folded ends as they pass between bands pressed on them by spring-loaded rollers.

Two-to-one conveyor feed system

Of special interest is the Rownsons system whereby the two lines of parcels issuing from the east and west machines are fed on to the single conveyor in alternate batches, automatically spaced, without possibility of congestion or collision. The system, for which patents are pending, is entirely automatic and is adaptable to different layouts of other equipment.

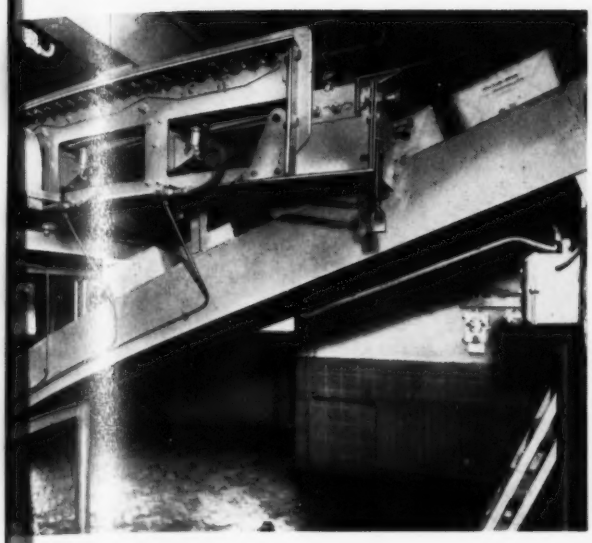


Fig. 16 (above). Two batches of five parcels from the eastern and western lines being delivered alternately on to the final conveyor system

Fig. 17 (above left). The roller conveyor controlling the movement of parcels from the eastern parcelling machine. Under it are seen two of the three pneumatic cylinders and pivoted skid-plates that press up the continuously running belt to provide intermittent drive for the rollers. On the left is the belt-driving motor

From the west parcelling machine the parcels are conveyed straight on to a power-operated slat bend, while those from the east machine are conveyed up to a similar slat bend at a higher level. The slat bends serve the double purpose of motion and direction at right angles to the conveyor leading to the despatch department. Each delivers the parcels to one end of a short horizontal roller conveyor under which a continuously running band is pressed up under the rollers by three pivoted skid-plates operated by pneumatic cylinders, thereby rotating the rollers in three sections. The band is driven by an electric motor, and to ensure a positive drive without slippage, it is tensioned by an adjustable roller and pressed on the surface of the driving pulley by another carried by a pivoted spring-loaded arm.

A continuously running camshaft, having six cams, controls six spring-loaded pneumatic valves by which air pressure is supplied to the skid-plate operating cylinders, three for the east and west conveyors respectively. Each

Fig. 18. Final conveyor line and power slat bend by which parcels are delivered for transfer to the pallet loader in the despatch department

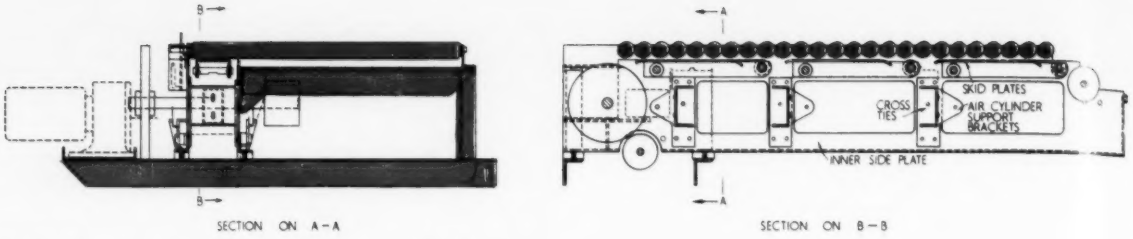


Fig. 19. General arrangement of the Rownsons powered feeder system

set of three cams opens three valves simultaneously, thus causing all the rollers of the respective conveyor to start rotating together and draw the waiting line of parcels forward. When five are on the rollers, the three cams allow the valves to close in succession so that the pressures on the driving band exerted by the three skid-plates are relieved in succession also and, commencing with the first at the entrance end of the conveyor, the three sections of rollers consecutively cease to be rotated. Thus only five parcels on the conveyor are carried forward, and the next and following ones are halted. Operation of the two sets of cams is timed to ensure alternate delivery of the east and west parcels on to the final conveyor, those from the west line being carried by it up to the higher level where the east line parcels are delivered down a balanced ramp which is deflected by their weight but rises to give a clear passage for the west line parcels as they are drawn under it.

Though normally the parcels are handled in batches of five, variations in the outputs of the parcelling machines may cause this number to be reduced, without, however, affecting the timing and separation of the alternate deliveries. The total number of parcels delivered from each line is recorded by a counter on an adjacent wall and operated as they interrupt the light beams from photo-electric cells.

Loading for delivery

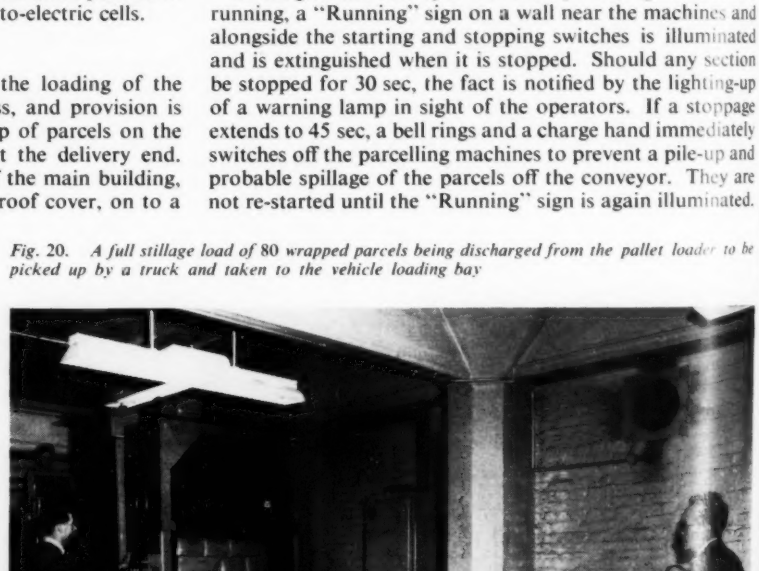
The final handling of the parcels for the loading of the delivery vehicles is a continuous process, and provision is made to ensure against a serious pile-up of parcels on the conveyors in the event of a hold-up at the delivery end. The belt conveyor, after passing out of the main building, rises to a higher level and leads, under roof cover, on to a gravity roller conveyor down which the parcels are directed on to a power slat bent and by it at right angles on to another roller conveyor entering the despatch department. A girl attendant feeds them to a pallet loader manufactured by Rose Brothers (Gainsborough), Ltd.

At the top of the pallet loader, which is electrically and pneumatically operated, is a slightly inclined roller loading table on to which the attendant marshalls the parcels in layers of 10. As each layer is completed, she presses a pedal switch when a pusher bar, carried between and operated by two endless chains, moves it forward down the table so that it is carried further by an air-operated roller conveyor until it is stopped by a rubber-covered cross-bar. It is then in position above a stillage on a lowerator platform. The conveyor is immediately drawn back from under the layer, leaving it on the stillage, and the platform is automatically lowered to a depth of one layer so that the stillage is ready to accept the next one. When a stillage has been loaded with eight layers, that is, 80 parcels, weighing 1 ton, it is discharged forward out of the machine by conveyor mechanism to be picked up by a Lansing Bagnall electric lift truck for conveyance to the vehicle loading bay. The stillages are loaded by an attendant, five at a time, into a magazine from which they are automatically transferred by an air-operated conveyor on to the lowerator platform as each is required for loading.

Each complete stillage-loading operation occupies about 2 min, during which time the attendant may find it necessary to hold back the flow of entering parcels while a stillage is being fed from the magazine. This is done by stopping the slat bend temporarily by pressing a switch and re-starting it in order to assemble the next layer. The attendant is also able to switch off and stop the conveyor from the parcelling machines, which is in three sections, should the pallet loader be out of action. The roller conveyor feeding the loader is continued beyond it and sloped down to near ground level. Instead of stopping the belt conveyor, the attendant can let the parcels by-pass her so that they can be transferred by hand on to the stillages and the output flow of parcels is not interrupted.

So long as the conveyor from the parcelling machines is running, a "Running" sign on a wall near the machines and alongside the starting and stopping switches is illuminated and is extinguished when it is stopped. Should any section be stopped for 30 sec, the fact is notified by the lighting-up of a warning lamp in sight of the operators. If a stoppage extends to 45 sec, a bell rings and a charge hand immediately switches off the parcelling machines to prevent a pile-up and probable spillage of the parcels off the conveyor. They are not re-started until the "Running" sign is again illuminated.

Fig. 20. A full stillage load of 80 wrapped parcels being discharged from the pallet loader to be picked up by a truck and taken to the vehicle loading bay



RUBBER SUSPENSION FOR FACTORY TRUCKS AND MINE CARS

Simple Forms of Springing with Metalastik Components

SPRINGING is required by Ministry of Transport regulations on factory trucks which may have occasion to use the public highway and it is often needed to protect fragile or brittle loads from shock and vibration, particularly in premises where solid rubber or pneumatic tyres cannot be used. Cast iron wheels on comparatively smooth floors can set up vibration and on uneven surfaces severe jolts can be transmitted to the load if there is no form of springing. Springing also helps to reduce damage to floors and the danger of movement of the load by helping to keep the platform level.

As industrial trucks operate at low speeds, high spring deflections are not required, the normal range being from 0·125 in to 0·5 in. Deflections of this order can be provided by rubber-bonded-to-metal springs manufactured by Metalastik, Ltd., for isolating vibration from machinery. As these units are compact, easily fitted, free from wear and the need of lubrication, they are suitable for factory truck suspension. Available in many designs they allow considerable freedom in the design of suspensions for various types of truck.

Figs. 1 and 2 illustrate a suspension for a 3-wheeled non-powered truck operating in a chemical factory. Working conditions necessitate the use of cast-iron wheels and the suspension is fitted to cushion shocks from the wheels on rough surfaces. Four *Metacone* springs arranged in a square are employed for the castor wheel and under a load of 500 lb give a deflection of 0·125 in. Bonded rubber sandwiches in an inverted V formation provide the axle suspension which deflects 0·4 in under 1,800 lb. The springs are inclined at 30 deg to the vertical so that they are in shear and compression under vertical and fore-and-aft loads. They are, however, stiffer in the longitudinal direction in which the compression component is much higher. No special provision is required to limit transverse movement as side loads are small.

Metacone springs (Figs. 3 and 4) designed and patented by Metalastik were developed for mounting petrol and diesel engines and the characteristics which established their success for this purpose render them equally effective for castor wheel suspension. They have high load capacity, give large vertical deflections, permit some angular movement and have the same stiffness in all horizontal directions. While providing cushioning in a horizontal plane the mountings are stiff enough to limit transverse movements

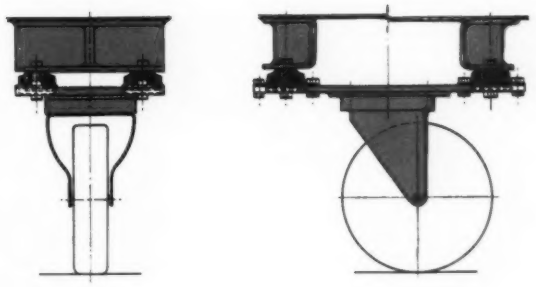


Fig. 1. Castor wheel suspension with four Metacones of the type shown in Fig. 3

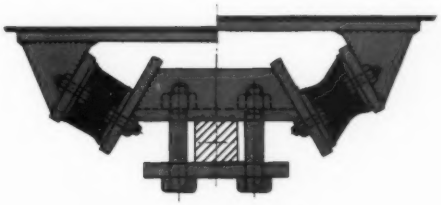


Fig. 2. Axle suspension for 3-wheeled truck. Bonded rubber sandwiches are inclined so that vertical and fore-and-aft loads are taken in shear and compression

without additional means, and the rubber flange which comes into operation under overload conditions is formed integrally with the mounting.

Fig. 5 shows how one of the Metacone family of springs makes a neat single-point suspension for stabilizing castors on a Lansing Bagnall truck of normal pattern (Fig. 6) having three wheels with the single front wheel driving.

Springing has been adopted for the castors, which are fitted one each side of the front wheel, because excessive tyre wear and mounting bracket fractures have been experienced when the castors are rigidly mounted. Flexible

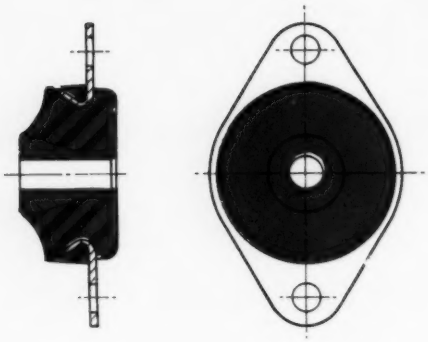


Fig. 3 and Fig. 4. Different types of Metacone mounting. The mounting shown diagrammatically is used for the castor wheel suspension in Fig. 1 while that in the photograph is employed for the single-point castor suspension in Fig. 5

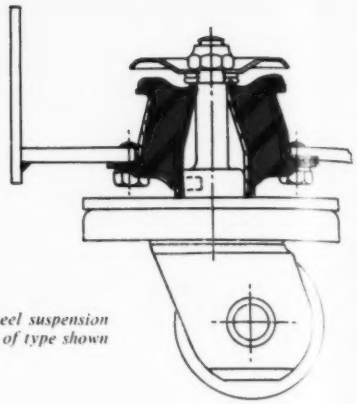


Fig. 5 (right). Castor wheel suspension for Lansing Bagnall truck of type shown in Fig. 6

mounting reduces the loads due to bouncing from one castor to the other on uneven ground and to the castors turning suddenly into line. The *Metacones* are soft enough to eliminate the possibility of all weight being removed from the driving wheel and deflect a maximum of 0·375 in.

Vibration created by cast-iron wheels on trolleys for conveying cigarettes in tobacco factories can be severe enough to loosen the tobacco and simple forms of rubber suspension are employed to overcome damage caused in this way. In the cigarette tray trolleys manufactured by D. K. Hamblin & Co., Ltd., *Metacone* mountings are fitted between the base and framework carrying the trays (Fig. 7).

A suspension developed in conjunction with Ransome, Sims & Jefferies, Ltd., for a 4-wheeled battery-driven vehicle is shown in Fig. 8. In this patented suspension each axle is carried on a sub-frame attached to the truck platform with bonded rubber sandwich mountings. These are placed

Fig. 6. Lansing Bagnall pallet truck in which the stabilizing castors are flexibly mounted on Metacones

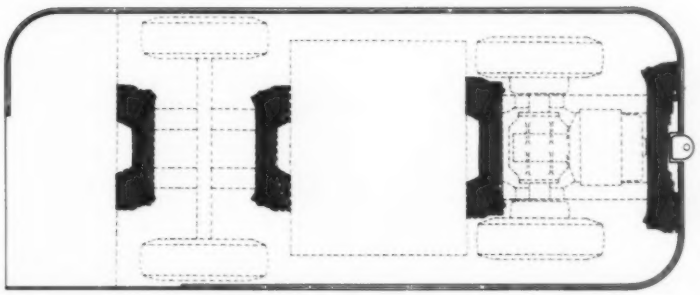
across the corners of the sub-frame and inclined so that vertical, side and fore-and-aft loads are taken in shear and compression. A very similar axle suspension is fitted on railbuses now in service on British Railways.

The suspension in Fig. 9 requires eight sandwich springs for each axle. These are arranged so that there is ample vertical deflection with control of side and fore-and-aft movements. Various standard rubber-bonded-to-metal sandwiches are shown in Fig. 10.

Double-U-Shear springs, Fig. 11, also make a neat and effective suspension. Fig. 12 shows how eight of these units have been arranged to provide springing for another design of cigarette trolley.

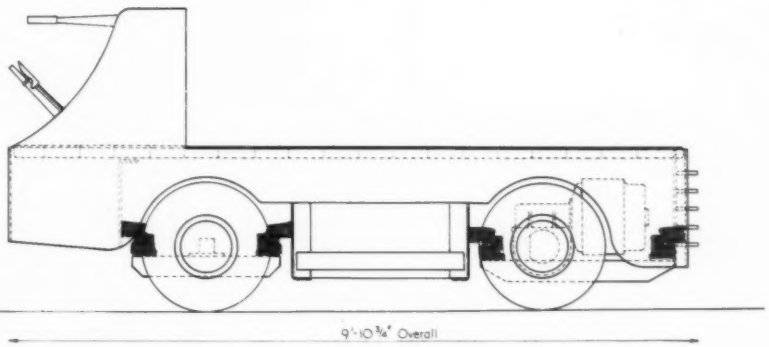
LEFT

Fig. 7. In these cigarette tray trolleys by D. K. Hamblin & Co., Ltd., Metacones are fitted between base and framework to prevent the transmission of vibration from the wheels to the cigarette trays. A mounting is fitted at each corner as shown by arrows



RIGHT

Fig. 8. Suspension developed by Metalastik, Ltd., in conjunction with Ransome, Sims & Jefferies, Ltd. Each axle is carried on a sub-frame attached to the truck platform with bonded rubber sandwich springs

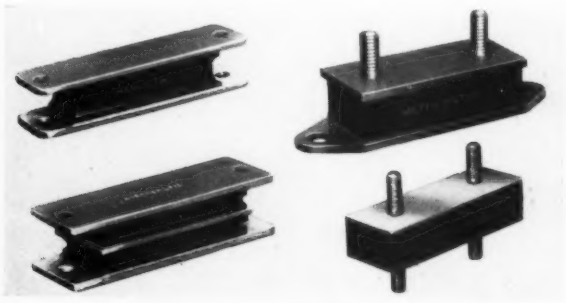


BELOW

Fig. 9. Eight sandwich springs are required for this suspension which gives ample vertical deflection and constraint in transverse and longitudinal directions

BELOW RIGHT

Fig. 10. A group of standard sandwich springs



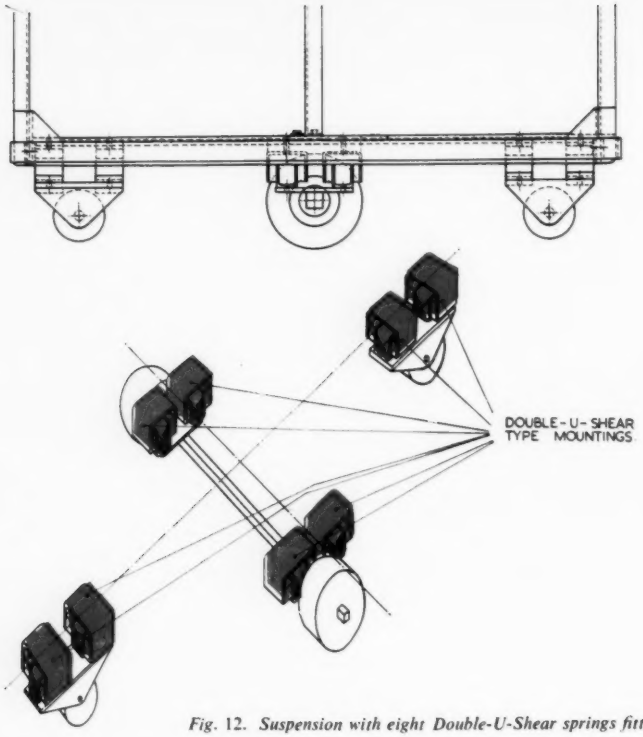


Fig. 12. Suspension with eight Double-U-Shear springs fitted in pairs

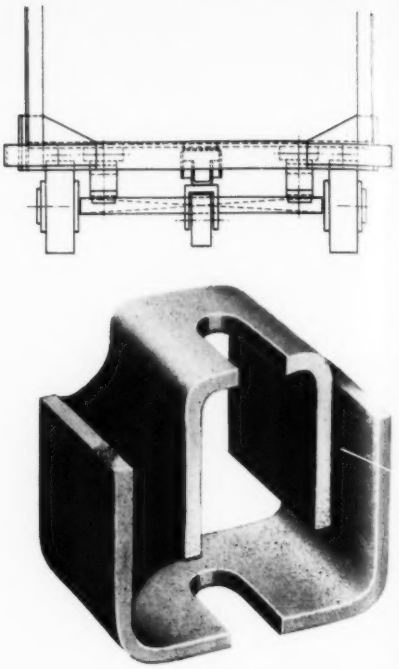


Fig. 11. Metalastik Double-U-Shear unit

Fig. 13 is an axle suspension for the standard type of 4-wheeled mine car. This arrangement, in which the axles are supported in chevron-shaped, bonded rubber springs follows the same principle as Metalastik axlebox suspension for London Transport tube trains. The suspension eliminates wear as there are no sliding surfaces to cause friction and needs no lubrication. There is no free movement in any direction and shocks in all directions are cushioned in rubber. Under vertical, transverse and longitudinal forces, the rubber chevrons are always in shear and compression. Sensitive to shocks too small to overcome the friction of leaf springs, the chevron suspension provides greater comfort on man-riding cars.

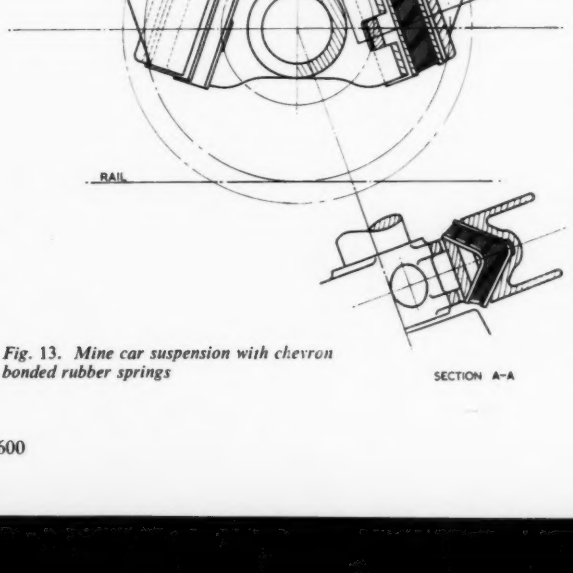


Fig. 13. Mine car suspension with chevron bonded rubber springs

The chevrons are arranged in an inverted 'V', the included angle being 40 deg. If castings are used for the inner and outer supports for the chevrons, a suitable shock-resisting material must be specified. Faces on the supporting members are angled to cradle the chevrons and keys welded across the inner metal plates of the rubber springs engage in slots in the faces of the inner support member fitted on the axle. The stud, which is tapped into the inner spring support and passes through a hole in the frame of the car, is fitted to retain the axle in case of derailment.

With this suspension a static vertical deflection of 0·5 in can be provided for cars weighing 4 to $7\frac{1}{4}$ tons, by varying the hardness of the rubber. While static deflections in excess of 0·5 in are not normally required for industrial trucks, rubber suspensions to provide very much higher deflections can be provided.

Jetty Crane on Curved Track

An electrical differential is used in one of two 4-ton travelling jetty cranes recently supplied to Tunnel Portland Cement Co., Ltd. The crane works along a curved track, on four 'free' 2-wheel bogies. One bogie on each side is driven by a Crompton 25-h.p. weatherproof 'Klosd' motor through worm gearing and the differential takes the form of cascade connection of the motors, combined with Allen West control gear.

The radius of the curve between centres is 168 ft and the crane track gauge is 36 ft 4 in. An otherwise identical crane, with motors conventionally connected, works over the straight portion of the jetty. The two cranes span three rail tracks of standard gauge which serve the Tunnel Cement Works about a mile inland and are used for loading and unloading of vessels berthed alongside the jetty. They are not intended to travel with load. The cranes were built by Stothert & Pitt, Ltd.; five Crompton Parkinson motors are used in each crane.

ACTIVITY SAMPLING AND THE TRAVEL CHART

By D. E. GREENE, A.M.I.Prod.E., A.M.B.I.M.*

Two problems frequently occurring in the handling and transport of materials are: (1) Have we enough mechanical handling aids (or do the existing mechanical handling aids enjoy a high enough utilization factor)?; (2) Are the various sections of a department, or the various departments of a factory, so situated in relation to each other that there is the minimum amount of travel of documents and goods between sections and between departments?

For the solution of these problems there are two aids to study and analysis which perhaps are not so widely used as they could be—activity sampling and travel charting. Activity sampling is the better known of the two. It was originated by L. H. C. Tippett[1], in the English textile industry a few years before the Second World War and during the 1950's its practice spread among work study personnel. Travel charting appears to have been first developed in the United States in the early 1950's, although it was not till 1954[2] that the knowledge of it began to cross the Atlantic.

In the two types of problem mentioned above activity sampling is a method by which facts are ascertained. It is based on the theory of probability as related to a binomial distribution of events. In the second type of problem having ascertained the relative density, or weight, or volume of traffic between various points, or areas, these facts may be marshalled and analysed by means of the travel chart.

This article is divided into three sections. The first is a simple statement—that before attempting to solve a problem the facts must be ascertained, and that in certain types of problem activity sampling is a very suitable method of ascertaining the facts; because it is based on sound statistical theory. In the second section, therefore, activity sampling procedure will be described, preceded by the relevant statistical support. The writer feels that readers of this journal who are likely to be responsible for initiating and controlling an activity sampling programme must know more than just the drill. The third section will show how, having employed activity sampling to obtain the facts, these facts may be used to construct and analyse a travel chart; with, of course, a view to improving factory or office layout and so to reduce materials handling.

Activity Sampling, Mathematical basis

In the kind of problem to which activity sampling is applied it is often undesirable, and inconvenient, to attempt to obtain information by maintaining a continuous watch on the scene of activity. Sampling is then resorted to. If the sample is selected at random from a normal population it should give a good indication of the state of the whole population, i.e., a sample is analagous to a miniature portrait. In this concept there is nothing new. One often forms an impression from a number of chance observations. In serious industrial problems, however, it would be irresponsible, and perhaps disastrous, to act on an impression. An impression does not provide one with facts, confidence and accuracy. Statistically, therefore, enough observations must be made, and in such a manner, as to enable the investigator to state with a sufficient degree of confidence that he has obtained the facts, expressed in figures, and with the required degree of accuracy.

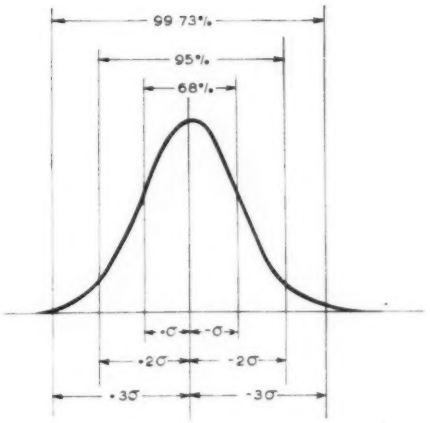


Fig. 1. Normal distribution curve

Suppose, for instance, that desiring to ascertain the utilization factor of a yard locomotive, an investigator makes 10 random visits to the yard. His record of observations shows that on four of these visits the locomotive was doing useful work but during the remaining visits it was idle. Is it right to conclude that the utilization factor is 0·4? It needs only a little reflection to realize that a mere 10 visits will not give a reasonably accurate figure as a utilization factor.

The arguments that now follow are derived from an

* Northampton College of Advanced Technology, London.

understanding of the Normal Distribution Curve, Fig. 1. The significant word here is the word 'Normal'. It is important to realize that such a curve, and the conclusions derived from it, are valid only if the data on which it is based was obtained from a large enough population behaving normally. There must be no bias or assignable cause of variation present. Variations that do occur, because they are due to chance causes, are dispersed equally about the variable being observed. The measure of the dispersion is expressed by what is known as the Standard Deviation, i.e., the root mean square deviation from the mean[3]. Geometrically, the standard deviation is to be found at the point of inflexion on the curve. The usual symbol for standard deviation is the Greek symbol σ (sigma).

The area under the curve, between any two ordinates, is proportional to the total area of the curve. Approximately 68 per cent of the total area lies between $\pm\sigma$, 95 per cent lies between $\pm 2\sigma$ and 99·73 per cent between $\pm 3\sigma$. This means that, in making a large number of random observations of a particular activity, during a representative period, it is possible to state with 68 per cent confidence that the variable, p, being observed will lie within $p_0 \pm \sigma$, p_0 being the observed occurrence. A confidence level of 68 per cent is not acceptable. For commercial and industrial purposes the extra cost of obtaining a figure at a 99·73 per cent confidence level is not worth while. In the majority of activity sampling studies, therefore, a 95 per cent level is the aim.

It must also be decided, having in mind the purposes of the study, what accuracy is required and, at 95 per cent confidence level, how many observations must be made to obtain it. The equation used for this purpose is:

$$a = 2\sqrt{\frac{p_0\,(1 - p_0)}{N}}$$

where a is the required limits of accuracy, expressed as a decimal fraction of the total number of observations,
N is the total number of observations to be made
p_0 is the observed occurrence of the activity or delay, expressed as a decimal fraction of N.

Suppose, in the case of the yard locomotive mentioned earlier, it was required to obtain a figure for its utilization factor accurate to $\pm 0{\cdot}04$. The equation just given is then restated as:

$$N = \frac{4p_0\,(1 - p_0)}{a^2}$$

But in this expression there are three quantities a, p_0 and N, of which at the beginning of the study we know only one, i.e. a, the accuracy we require. It is unlikely that nothing at all is known about the utilization of this yard locomotive so an estimate, or perhaps a short pilot study of, say, 150 observations, is made, in order to give a starting point. Call this 0·3. On this basis

$$N = \frac{4 \times 0{\cdot}3\,(1 - 0{\cdot}3)}{0{\cdot}04^2}$$

$$= \frac{4 \times 0{\cdot}3 \times 0{\cdot}7}{{\cdot}0016} = \frac{400 \times 0{\cdot}21}{0{\cdot}16}$$

$$= \frac{84}{0{\cdot}16}$$

$$= 525$$

This figure, however, cannot be accepted without reservation, as we still do not know the true value of p. Therefore, as the study proceeds and the cumulative number of observations increase it is necessary to work out for the various values of N up till then obtained, such as 300, 400, 500, the observed occurrence p_0. The results are then displayed graphically in the manner shown in Fig. 2 until such time as p_0 levels out and it is clear that a stable and final value of N has been obtained.

At the end of the study, i.e., after N observations have been made, it is necessary to check that the value obtained for p_0 has the desired accuracy. The values obtained for p_0 and N must be inserted in the equation and a ascertained. If in the case mentioned 650 observations had given a value for p_0 of 0·27 then

$$a = 2\sqrt{\frac{p_0\,(1 - p_0)}{N}} = 2\sqrt{\frac{0{\cdot}27\,(1 - 0{\cdot}27)}{650}}$$

$$= 2\sqrt{\frac{0{\cdot}27 \times 0{\cdot}73}{650}} = 0{\cdot}03$$

This means that after 650 observations it could be said with 95 per cent confidence that the yard locomotive was in use for only between 24 per cent and 30 per cent of the time for which it was available. If activity sampling studies are carried out frequently even the comparatively simple calculations described need not be made every time. Use can be made of tables and nomograms[4].

Study procedure

The technique being described in this article consists of carrying out a large number of random visits to the scene of activity in order to make, on each such visit, an instantaneous observation of the activity or work going on; and then to analyse the results of the observations in the manner already described. It is clear that this procedure will be quite unwarranted if only one machine or one operator is being studied. It is equally clear, however, that if information is required about a number of machines and/or operators then activity sampling is a very suitable method of obtaining the information. This is particularly true if the subjects of study are not too far away from each other.

If the results of the study are to be statistically reliable careful preparation for it must be made and certain points

Fig. 2. Chart for determining N

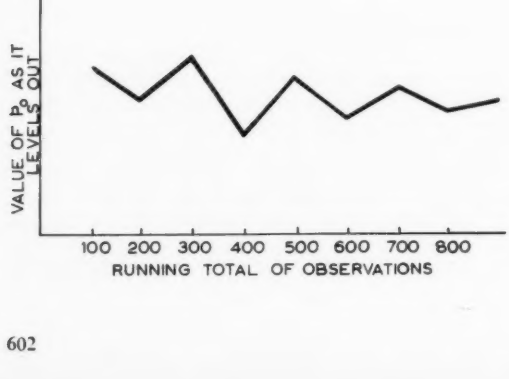
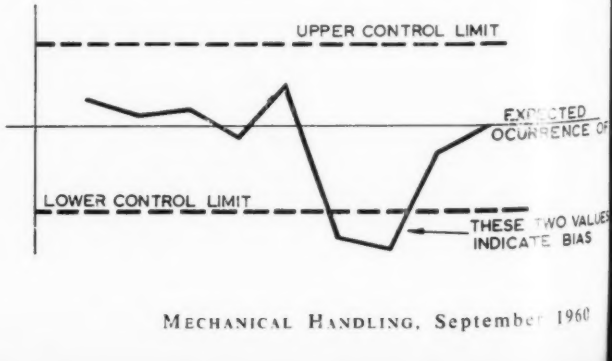


Fig. 3. Chart for detecting bias



meticulously observed. The most important of these are:

(1) The observations must be instantaneous. Only what is seen at that moment of observation must be recorded; not what the observer thought was about to happen, or had just happened, or what ought to be happening.

(2) The visits must be completely random over the whole period selected, from day to day and from week to week. If the observer falls into a set routine this will soon be detected and behaviour adjusted accordingly. To fix the times of the visits, therefore, recourse must be had to random number tables[4], or to card randomization. Card randomization is a process similar to that of drawing numbers out of a hat. On each card is written a minute of the day—M 801, M 802, T 1023, W 234 and so on, for every minute of every day, during which the study is to be carried out. The cards are thoroughly mixed in a barrel and are then withdrawn, one by one, to give the times for the number of visits that are to be made. Perhaps the quickest way of obtaining several thousand random numbers is to set up and programme a computer to produce them.

(3) All bias must be eliminated. Investigators must be on the alert for periods of unusual activity or idleness, absence of supervisors or key operators, breakdown of special-purpose machinery or services and so on. Any of these, if undetected, can invalidate a study. In order to detect bias control charts must be kept. These charts are similar to the control charts maintained by Statistical Quality Control practitioners. By setting upper and lower limits to the observed occurrence p_0 and plotting p_0 at fairly close and regular intervals, any bias entering into the study should be revealed, Fig. 3. For a fuller discussion of such charts see chapter 10 of reference 3.

(4) In order that all behaviour should be 'Normal' it is important to obtain the co-operation of all concerned. Activity sampling must be 'sold' to shop floor personnel and their supervisors.

Preparatory work, before actually commencing the rounds of observation, usually consists of three stages:

(1) Determining clearly the purpose of the study, e.g., to find the utilization factors for certain pieces of plant and equipment and the nature and proportion of the causes of idleness. Generally, it is quite inadequate merely to determine what proportion of time is being wasted or not utilized. In order to make improvements it is necessary to know what are the causes of delay. A breakdown of the total idle time into some such classification as follows is therefore desirable.

Operator (or driver) absent from machine.
Machine being repaired.
Operator at stores.
No work for machine.

(2) Designing the forms used for the study. Each study is a project on its own and although there will be a certain similarity about the forms used the forms used in each study have to be designed for that study. A typical observation form is shown in Fig. 4. The observer makes a check mark to indicate what class of activity was observed at each moment of time. At the end of the study the information on these forms are easily summarized and analysed giving the percentage of time attributable to each activity and delay. These percentages must be checked as already described.

(3) Planning the study procedure, i.e., selecting the observers, deciding routes, fixing random times, determining the length of the study. One of the advantages of activity sampling is that the observers who actually carry out the rounds need be only comparatively junior and inexperienced personnel, thus reducing the cost of the study. They should, however, be reliable. The observations must be honestly made and correctly recorded. The total number of observations to be made, as determined from pilot studies and/or calculations, should be spread out over a representative period, sometimes many weeks. If necessary, the study can be interrupted and resumed later without prejudice to the results.

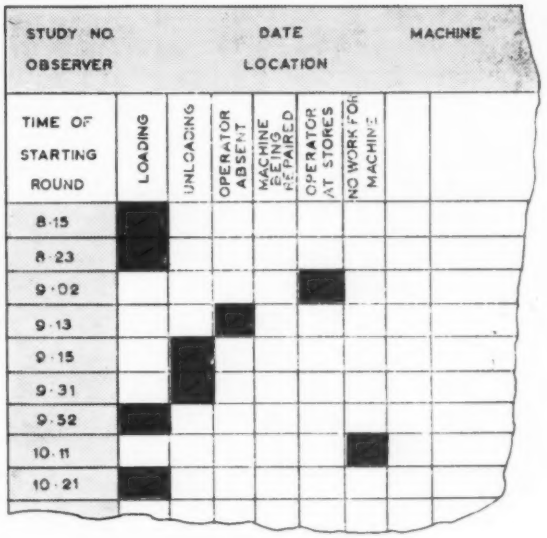


Fig. 4. Typical observation sheet

This article is no longer concerned with problems of the first type. It has been shown how to determine the utilization factor of material handling equipment such as bridge cranes, yard cranes, fork lift trucks and so on.

The second type of problem is concerned more with replanning an existing layout rather than planning a new layout. The latter case is the easier one, where, having established the sequence of operations or processes, the equipment is laid out to suit this sequence. After some years, however, especially in the batch production industries, an accumulation of minor alterations and expansive activities has evolved a layout which is now causing much back-tracking, cross traffic and congestion.

When a factory is admittedly not a mass production organization it is generally assumed that a line or flow production layout is unnecessary and/or unobtainable. This may be a mistaken conclusion. In a batch production factory a number of different products are ordered in batches of various sizes. The products, or the component parts, are usually made from the same kinds of materials, by means of the same physical operations or processes, carried out on a miscellaneous collection of equipment. The batches do, however, vary from batch to batch in the number of operations required and the sequence in which these operations are to be done. In many cases this situation appears as an insuperable barrier to a flow production layout. The remainder of this article shows how Activity Sampling and Travel Charting may be used to design such a layout.

In a previous article[5] the writer showed how the work study approach may be applied to materials handling problems. Bringing this procedure to bear on the present case the problem may be defined as 'to reduce the amount of materials handled and the distances over which they are transported by so relocating the various departments in relation to each other than an approximation to flow production is obtained'. With existing sites and buildings there are usually limitations to the freedom of action of an

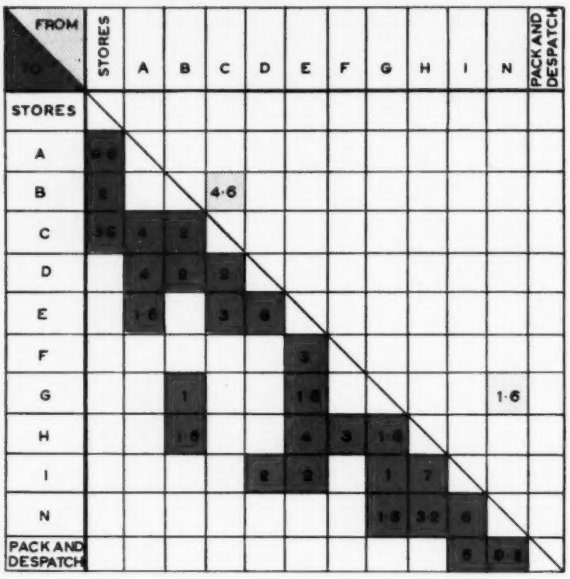


Fig. 5. Travel chart, showing, of the total traffic within an area, the percentage between each pair of departments, or sections, but in one direction only

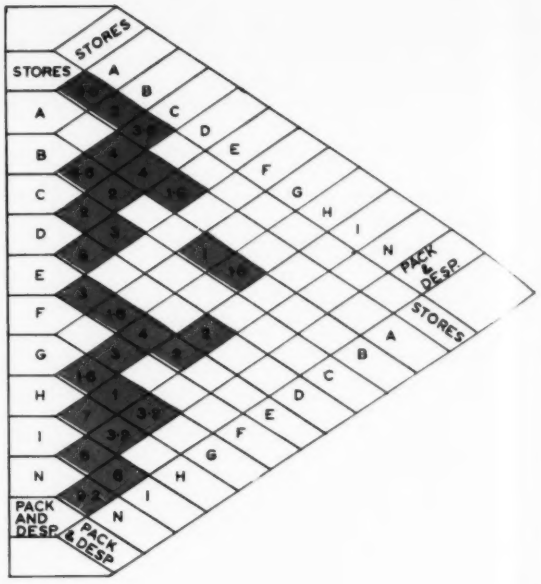


Fig. 6. Summarizes the travel chart and shows, in percentages, for any two departments, or sections, the sum of the traffic between those two departments

investigator and planner. Existing elevators, staircases, walls, railway sidings may not be altered. Certain floors may not be strong enough to carry heavy loads. Columns or pillars may not be knocked down to create an unrestricted floor space. Special purpose equipment with service connections may have to remain untouched.

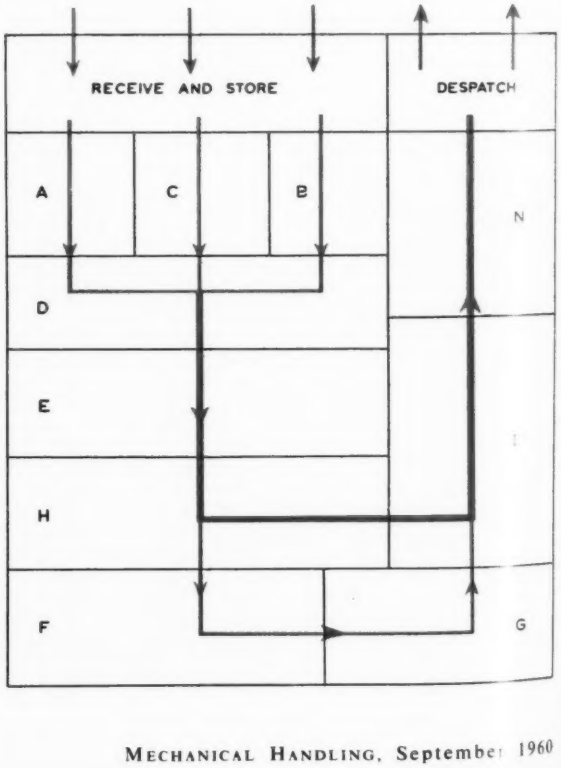
Having defined the problem and accepted the limitations the next step is to accumulate the relevant data. In this case it is necessary to ascertain which departments or sections of the factory should be located near to each other and which could be situated on the periphery of the whole area. This is done by finding out the nature, volume or weight, and frequency of the traffic between each pair of departments, i.e., between A and B, between A and C, between B and C, between D and B and so on for all departments and all sections.

Activity sampling is not the only means of obtaining information about the utilization of fork lift trucks or similar mechanical handling aids. The writer knows of at least two other methods—fitting elapsed time indicators to each truck, or requiring drivers to keep a log. Both methods, however, are open to objections. Elapsed time indicators can furnish information about the operating hours of a truck, but can say nothing about routes covered, frequency of journeys or loads carried. If trucks are at all busy it would be impracticable to expect drivers to keep an accurate log. If not busy, the log kept could not be relied upon, for obvious reasons. Therefore activity sampling is used.

A preliminary survey might reveal that there are, say, two means of transporting materials—fork lift trucks and hand trucks; by far the greater bulk of materials being transported by the fork lift trucks. The fork lift truck traffic is broken down into the various routes used. A decision must be made as to the amount of material carried by each truck on one journey. Since the observations to be made are random it will not be possible to determine the magnitude of each load at the time it is sighted. Should each load be treated as maximum load or average load? An activity sampling study might be necessary to decide this point.

The next part of the preparatory work is to design observation sheets and arrange for identification of the journeys made by the trucks. An observer sees a truck with a load on it going somewhere. His observation is to be instantaneous. Where is it going? Each truck driver is given a set of plates on which are painted symbols or letters carrying predetermined meanings. Plates for a

Fig. 7. Functional layout. U-shaped flow of material



particular journey are displayed on two sides of the truck. Routes for observers on their rounds must be carefully chosen to give as much information as possible. The study is then carried out in the usual manner. When evaluating the results a simple calculation expresses the load transported between the various pairs of departments (A and B, C and B, B and D, and so on) as a percentage of the total load transported.

Travel Chart

The travel chart is a very simple but effective means of indicating the relative movements of materials within an area or site. It can be adapted to large and small areas, factories, warehouses, goods yards, machine shops, restaurants, offices and so on. Different versions of it are in use[2,6,7]. The travel chart does not supersede the other and older tools used in materials handling and layout work. It is in appropriate cases, but a supplement to flow charts and string diagrams.

After checking for accuracy, the information from the observation and summary sheets of the study is transferred to the travel chart, Fig. 5 (a very familiar type of case). The figures are the percentages of the total load which are transported between the various departments. In comparatively simple cases an inspection of the figures may be sufficient to indicate what departments should be situated next to each other. But in more complex cases it is necessary to summarize still further the figures, as shown in Fig. 6, which is a summary for the quantities given in Fig. 5.

Even if not invariably, the operations on a batch often follow the same general sequence—A, B, C, D, and so on. Examining the summary it is at once clear that department A must be located next to the stores. Since there is also a significant amount of traffic between the stores and departments B and C and also between B and C and A and C these four areas must be located near to each other. It is also clear that department N must be located next to packing and despatch, and that H, I and N, together with packing and despatch could well form a block at the other end of the line of travel.

The ideal of a straight line of flow is often not possible because both entrance and exit to the site or building is governed by the fact that there is only one means—road or rail—of external communication. In such cases a U-shaped flow of material secures substantially the same advantages as a straight line layout. Both receiving and stores and packing and despatch will then be located on the same side of the building. Of the remaining departments not already mentioned the ones between which the most traffic occurs should be situated on the base of the U, or just inside it. The others may then best be located on the periphery of the whole area.

The resulting layout, Fig. 7, provides a U-shaped flow of material, functional disposition of equipment and the least amount of cross traffic and backtracking.

The material on which this article is based will be published in a more lengthy form in the first two chapters of a forthcoming book, to be published by Chapman & Hall, Ltd., London.

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BOOK REVIEWS

FLUID POWER CONTROL. Edited by John F. Blackburn, Gerhard Reethof and J. Lowen Shearer. Published by John Wiley & Sons, Inc., New York, and obtainable in this country from Chapman & Hall, Ltd., 38 Essex Street, London, W.C.2. 710 pages. Price 140s.

This book is a pioneer effort to present the fundamentals of the operation of power-control systems in which the working media may be either liquids or gases, and both analytical and experimental approaches are presented. The methods described can be applied, in the industrial field, to automatic machinery, automatic process control, automobiles and construction machinery. Emphasis is placed on the conversion, transmission and control of fluid power under conditions for which gravitational effects are negligible.

Consisting of four main parts, the book begins with a review of fluid properties and fluid mechanics. The second section deals with the theory and practice of hydraulic components, with emphasis on control valves. The last two parts describe recent progress in the use of gaseous working fluids, particularly high-pressure pneumatics. Also among topics discussed are the flow of fluids through closed conduits, orifices and valves, variable-volume chambers, pumps, motors and accumulators.

NUMERICAL METHODS FOR HIGH-SPEED COMPUTERS. By G. N. Lance, M.Sc., Ph.D., M.I.A.S., A.F.R.Ae.S. Published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. 166 pages. Price 42s.

To realise the full possibilities of which electronic computers are capable it is essential that they should be fed with information in the most suitable form. Programmers often find that classical methods of mathematical computation do not take full advantage of the facilities provided by modern automatic high-speed computing machines. Because of this, research mathematicians have developed new methods of solving complicated problems, many of which are applicable only to electronic computers. To date, most of these new methods have only been published in original papers which may not be readily available.

The author, who is in charge of the Digital Computer Group at the Atomic Energy Establishment, Winfrith, Dorset, and was formerly the director of the Computation Laboratory of the University of Southampton, has collected into a single volume the most useful of the new methods, including some which he has himself developed. Important considerations such as the degree of accuracy, the amount of storage space required and the time taken to obtain the result, have not been overlooked and there is an extensive and up-to-date bibliography.

This book should prove invaluable to programmers, mathematicians, engineers, physicists, chemists and scientists generally who are interested in the application of electronic computers to the solution of their own particular problems.

FULLY AUTOMATIC CONTROL OF PAINT SHOP CONVEYORS AT FRENCH MOTOR CAR FACTORY

By KAY MUMBY

A CONVEYOR complex claimed as being longer than any other in Europe, with facilities for automatic routing and speed compensation, has been installed by Simca in their factory at Poissy—a small town on the outskirts of Paris. Its purpose is to implement the company's policy of offering their customers motor cars that are *personalisées*, as they put it—or, as we should say, tailored to individual requirements—at the price that would normally be demanded for a mass-produced vehicle. This has been done by rationalizing production at the early stages and sequencing the operations and the routing of the models when the bodies go through the paint-spray processes—which occur at a very late stage in the manufacturing programme, and one at which variations have the maximum visual effect.

This has in principle been done before, and it is indeed common practice to offer customers a choice of finishes—though a more restricted choice. Simca, however, guarantee each customer the colour scheme he chooses—and his choice of the other alternatives available in the specification—when he places his order, with the assurance that the details conforming to his personal requirements will be built into the

Fig. 1. *View looking up the body-assembly lines. Overhead conveyors are used for storing sub-assemblies and bringing them down to the assembly stations*

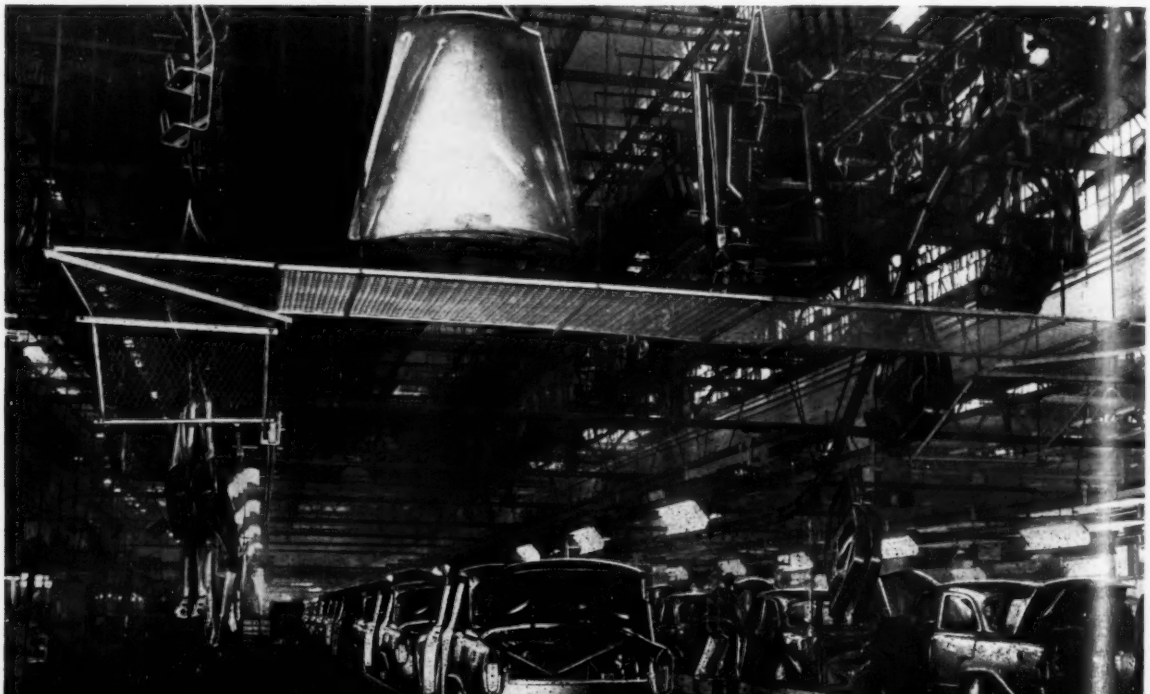
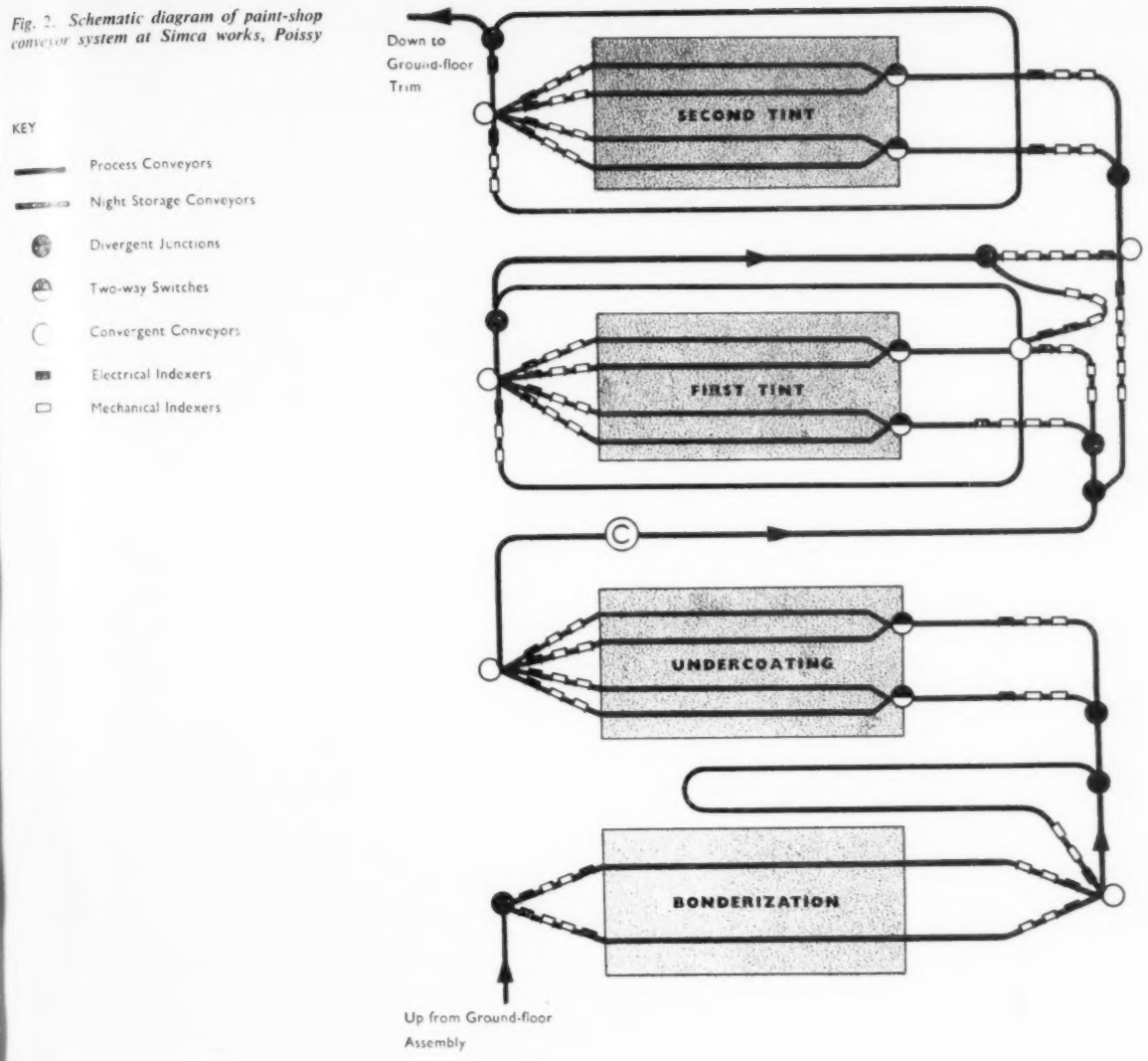


Fig. 2. Schematic diagram of paint-shop conveyor system at Simca works, Poissy



vehicle as it comes along the line. The customer gets what he wants without having to pay more or to wait longer. He is indeed getting the equivalent of a bespoke garment as though it were off the peg.

To achieve the effect of exclusiveness it was realized that a wide range of colours must be made available; hence Simca provide a choice of 15 tints in all possible two-colour combinations, for each of their five standard models. By advanced planning methods, and the adoption of an ambitious scheme of automatic handling in the paint shop, they have succeeded in applying colours to customer's order as quickly and economically as they would normally be applied in a factory where the variety was more restricted and the work was done in batches.

Prospective customers are given forms on which they are asked to set down, in considerable detail, all their various requirements. These forms govern the production programme. Requirements are recorded on punched cards, and the coded information is afterwards analysed by an I.B.M. electronic calculating machine and incorporated in the programme schedules issued each day to a man known as a 'dispatcher', who controls the release of bodies in white to the paint shop.

The paint shop is on the first floor of a three-storey building, in which the ground floor is used for assembly and trim while the second floor houses the air-conditioning plant. It provides the capacity for a potential throughput of 65 bodies an hour. At the time of our visit to the works the throughput was 800 vehicles a day, in two-colour combinations, the bodies passing through the processes of bonderization and rust-proofing, undercoating and sound-proofing, and spraying with first and second tints.

Simca *Ariane*, *Aronde* and *Chambord* models pass through the system simultaneously. Coachwork is of two basic types, the *Vedette*, produced in the Simca factory at Chaussons, and the *Aronde*, produced at Poissy, but the *Aronde* is subdivided into two-door and four-door models. The bodies are assembled on the ground floor and elevated, according to the daily programme, to the first-floor paint shop, where they are routed automatically through the appropriate operations at the rate of 42-60 units an hour.

The handling requirements can be classified broadly under

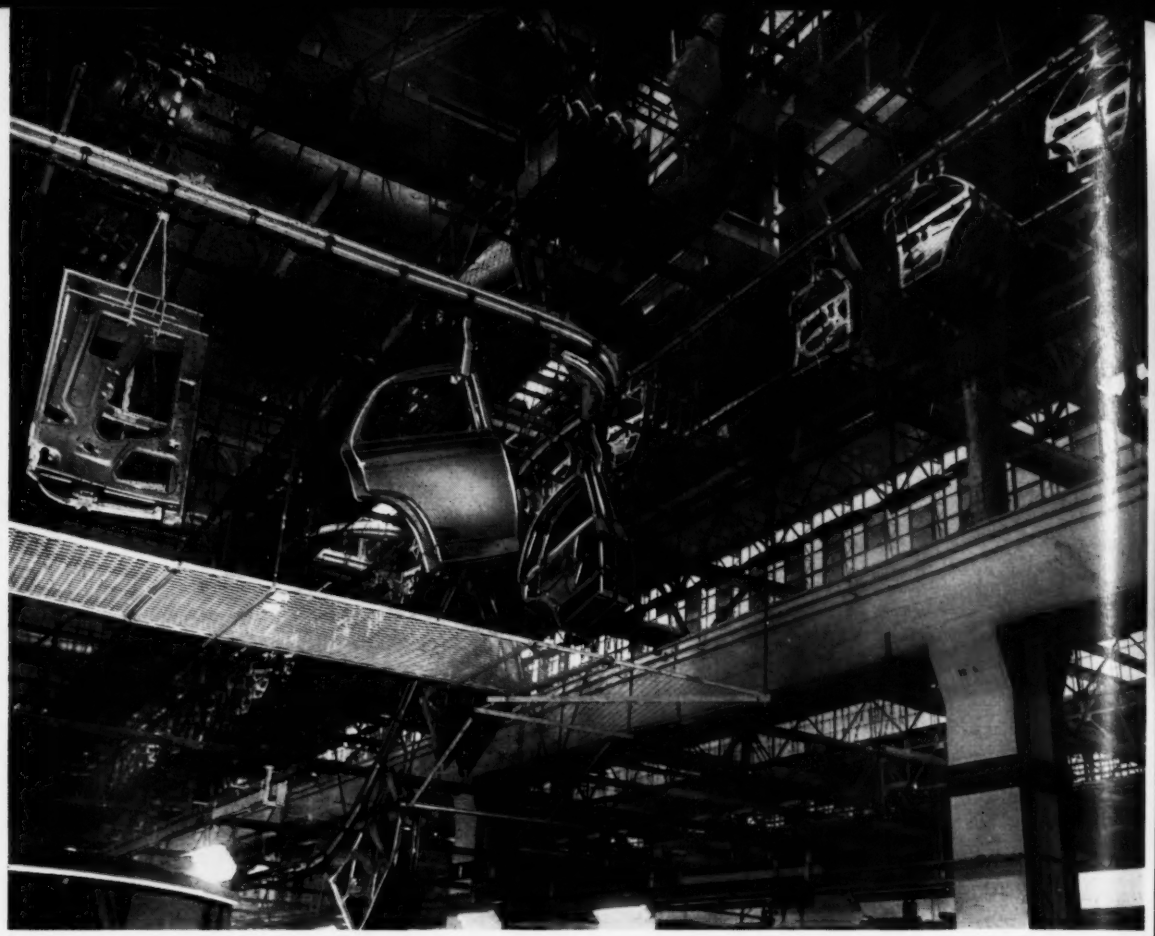


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Fig. 3. Overhead conveyors used for storing sub-assemblies and feeding them to the body-assembly lines

Fig. 4 (below left). Body rising in hydraulic lift section to overhead paint-shop conveyor while trolley used for transfer is wheeled away to the next assembly line

Fig. 5 (below right). Bodies in white on rising conveyor to paint shop

three main heads. Firstly, the bodies in white must be selected and transferred from the assembly line on the ground floor to the rising conveyor to the first-floor paint shop. They must then be passed in the correct order through the various preparatory and painting processes. Finally, the painted bodies must be transferred from the paint-shop conveyor system to the dropping conveyors serving the trim lines on the ground floor.

The arrangement of the conveyors is shown schematically in Fig. 2. Stages in the progress of the bodies from assembly to trim are illustrated in Figs. 1 to 16. Except for the two occasions at the interfloor transfer points where the electrical controls for the drop-sections are set by hand and the lifting

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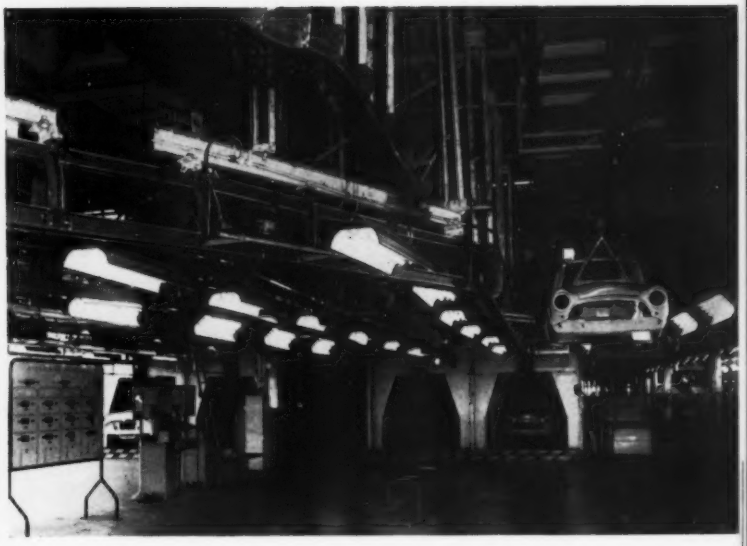

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Fig. 6. From his pulpit in mid-air, the 'dispatcher' looks down on the trim and assembly lines

Fig. 7. The panel from which the 'dispatcher' selects the bodies in white for transfer to the paint shop and signals the marshalling lines from which they are to come

Fig. 8. Bodies, with skids removed, entering the bonderizing ovens

Fig. 9. Bodies emerging in two lines from treatment ovens

Fig. 10. On emerging in two lines from the treatment ovens, the bodies will enter the indexers seen in the foreground, from which they will be released in correct sequence to a single-line conveyor

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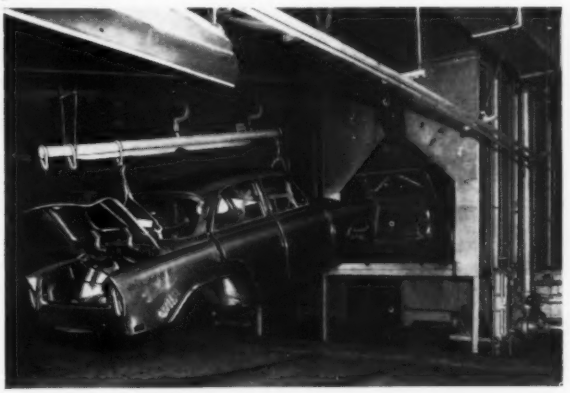

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yokes are dropped on to the pick-up lugs on the vehicles, the entire sequence is automatic. Control is by pushbutton from a pulpit overlooking the car bodies as they move forward from the six marshalling lines on the ground floor.

Before being raised to the first floor, the bodies are marshalled on six lines of slat conveyors, and on leaving the paint-shop the procedure is reversed. From the drop-sections the painted bodies are transferred to the six lines of slat conveyors, from which they proceed to three lines of body-trim—two for *Arondes* and one for *Arianes* and *Vedettes*.

At each end of the paint-shop sequence the bodies must be in the correct order—as they come off the marshalling lines for elevation to the first floor and again as they are delivered to the slat conveyors for body-trim.

The sequence is initiated by the selection of the line from which the next vehicle is to come—the line indicated being made known to the man on the floor by an electric light signal. On receipt of the signal the first body in the line is brought forward on a trolley to an hydraulic lift section and raised to the overhead conveyor that transports it, up a $22\frac{1}{2}$-deg slope, to the paint shop. This marks the first stage of the complex system of 47 overhead chain conveyors

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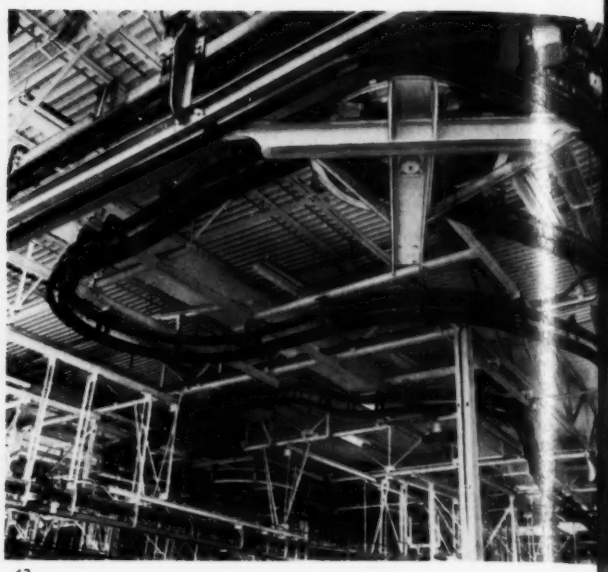

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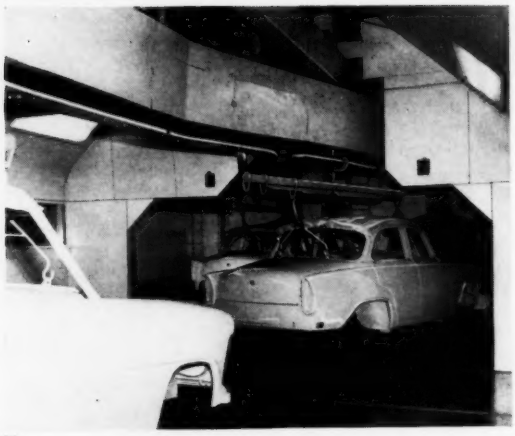

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Fig. 11. View inside one of the paint-spray booths where, though spraying is actually in progress, the air is perfectly clear

Fig. 12. Network of overhead conveyors and transfer devices at one end of the paint shop

Fig. 13. In this view of the overhead conveyor network can be seen, in the upper foreground, one of the transfer devices by which bodies are passed to conveyors moving at different speeds. The snaking black-painted conveyors in the middle-distance are for the storage of bodies at night

serving the paint shop. Extending for a total effective length of approximately 5·1 miles (8,200 m), this conveyor system supports 460 carriers in the production section, and another 210 in the storage section, and thus provides accommodation for 670 bodies.

As indicated in the schematic diagram, all bodies passing through the paint shop must undergo the preparatory treatment included in the first and second of the four main groups into which processes are divided, but their subsequent progress may be along dissimilar routes. They enter and leave the shop in single line, but must in the course of their journey make various deviations.

In addition to those made necessary by differences in treatment, there are divergences arranged to make optimum use of the space available and the energy consumed in heating the ovens. Thus the line is split on entering the paint-spraying and drying booths to enable bodies to pass through their treatment in two parallel streams, and again where the bodies are transferred to high-level loops for storage during the eight-hour period every night when the works are closed down for maintenance. During these shut-down periods the work in progress continues its journey through the stoving and drying ovens and then passes automatically into storage.

Units coming in on the assembly lines are selected for transfer to the paint shop according to body-type, but the type of the body is in no way related to the treatment it will receive. Bodies of any type may follow any of the routes through the paint-spray booths, and successive bodies may be routed differently.

Time is a critical factor in the various paint-shop treatments and the process times vary from one operation to the next. Spacing between bodies is another variable factor. In the paint-spray booths the units must be widely spaced, whereas in the ovens economy dictates the closest possible centres.

All these requirements must be met while the conveyors are running, without causing any interruption of the continuity of their movement. They involve the provision of a number of convergent and divergent junctions and automatic switching arrangements, which can be grouped under the following heads.

1. Divergent junctions at entry to ovens. These constitute the simplest requirement of the system. It is met by a mechanical switch by which each alternate body is transferred to a parallel conveyor running at the same speed as the main conveyor.

2. Convergent junctions at exit from ovens. Here it is necessary to introduce a selective device to prevent the entry of two bodies simultaneously.

3. Transfer to and from night-storage conveyors. Entry into the storage section is a simple transfer operation, but the discharge of the bodies from storage must be controlled to ensure correct mixing.

4. Junctions of lines diverging to different processes. Here there may be a variation in the speed at which the work passes through the successive treatment sections, or in the spacing, or both. Strict control must then be exercised over the selection of the bodies and the timing of their release.

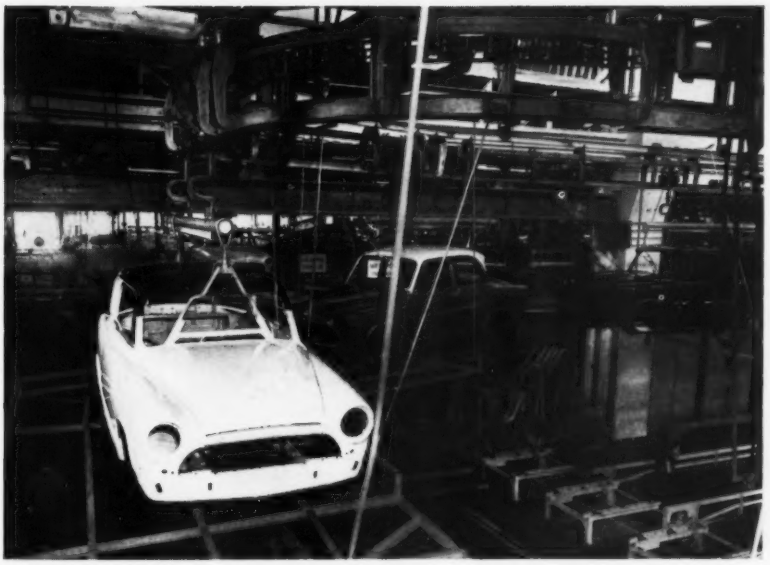

Fig. 14. Bodies painted in two colours, to three different specifications, en route from paint shop to trim

Fig. 15. Body painted in two colours about to enter a drop-section

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5. Junctions of lines converging from different processes. At convergent junctions the bodies must be released in such order that they mix correctly, and their release must be timed to conform with the speed of the conveyor to which they are transferred.

Sequencing Arrangements

The sequence of operations through which each body will pass is determined by the position of an actuating finger on the carrier, which makes contact with various electronic switches along the route. Indexers (Figs. 18 and 19), in which the carriers are separated from the main conveyor and rest on a loop runway until propelled forward and returned to circulation by pusher dogs, provide the facility for selection and dwell. Some of the indexers are operated electronically and others mechanically—the electronic indexers being actuated by signals received either from the central control-room (Fig. 17) or from another indexer. Thus, before entering a treatment section, the carrier must be released from an indexer operated electronically, the operation of which allows each of the next two or more bodies to be released by mechanical indexers and to move forward one stage.

Speed Control

Speed control is one of the most interesting features of the system. In addition to providing means for the accurate control of the speed of the conveyors, in accordance with the requirements of the treatment processes, means must be found to meet the basic requirement that when bodies are transferred automatically from one conveyor to another, the drive units to the individual conveyors must be very closely synchronized.

This requirement is met by driving an electro-magnetic coupling unit (Fig. 21) from each of the conveyors and feeding the differential signals obtained from one of the couplings into the electronic unit controlling the H.T. coupling that drives the slave conveyor. Couplings are normally driven from a corner position very close to the transfer point (Fig. 20), so that the effect of slack in the conveyor chain between the drive unit and the transfer point are eliminated.

A similar principle is used for exercising speed-proportioning control when the bodies that have been fed from single conveyors to branch conveyors are brought back along converging lines. The proportion of bodies flowing down each branch line must be very accurately controlled, to make sure that when they return to the single line they are mixed in the same order. The speed-proportioning control is effected by magnetic couplings which can regulate the flow of bodies along two branch lines in any ratio within the range of 3 to 1 and 1 to 3.

The final accurate trimming of the speed to ensure correct mixing is provided by a speed-compensating circuit. This circuit allows the speed of either of the two branch lines to be increased or decreased at a predetermined rate against signals received from counting devices that register the number of bodies flowing down each line.

One or more of these couplings is installed on each of the 47 conveyors in the system. There are more than 30 straight-line transfers from fast to slow, slow to fast, giving variations in the range of 26 ft 3 in to 78 ft 9 in per min (8 to 24 m per min).

The coupling, as has been explained, is controlled by a system of electronic relays. These are geared to the conveyor marked C on the flow diagram (Fig. 2). Secondary systems

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Fig. 16. *Looking down the lines of body trim, one sees what the customer gets as a result of it all: a motor car painted in the colours of his choice as it passes through the normal processing sequences*

Fig. 17. *Control room from which instructions are transmitted for the release of bodies from indexers and the speed regulation of the conveyors*

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are based on the occupancy of the indexing sections, in relation to the speed of the master speed-control conveyor. The number of bodies in the indexing section is counted by a relay tree and an increase or decrease of 3, 7 or 9 per cent can be effected in accordance with signals received by the coupling. Thus, if the occupancy is greater than 50 per cent, the speed of the conveyor is reduced by 5 per cent, and so on.

Release of bodies at three-way convergent junctions is also signalled electronically—the units being counted by relay tree to determine the line from which they should be released.

In the standard basic circuitry of the magnetic couplings a mercury-vapour grid-controlled valve is used for A.C. rectification and control. D.C. output from this valve is modulated by the output voltage of a small Alnico permanent-magnet governor-generator fitted to the output shaft of the coupling. The output of this governor, the voltage of which varies directly with the speed, is fed by the transformer and a separate metal rectifier to the grid of the main rectifier-valve.

This circuit is so arranged that should the output speed of the coupling rise by even a very small amount, due to a decrease in load, the increased output of the governor, which is suitably amplified in the transformer rectifying valve stage, is sufficient to overbias the main rectifier valve and cut off the flow of current through it.

When excitation has been removed from the coupling the output speed will fall until the original pre-set speed is again reached, when the valve will again pass current.

Conversely, if the output speed of the coupling tends to fall, due to an increase in load, the output of the governor will fall in sympathy, allowing the main rectifying valve to pass more excitation current to the coupling until the original speed has been substantially restored.

As the electronic governing action is extremely rapid in practice, it is impossible by normal methods of observation to detect any appreciable change in the output speed of the coupling on the conveyor drive, in spite of comparatively large load-variations. The drive is taken up so smoothly, and speed is decreased and increased by such minute increments, that to the observer the acceleration appears to be uniform.

In addition to their more specific functions of speed control, the couplings, by balancing the load on the various drive-units, have the effect of relieving the overhead chain conveyor of a great deal of strain. One result of this load sharing is to modify the function of the chain-tensioning devices, which are no longer required to compensate for inequalities in the pull on their various strands and are used solely to take up those increases in chain length that are due to wear alone.

Electro-hydraulic Drop-sections

Everything on the paint-shop floor is operated electronically or electromechanically. The drop-sections, on the other

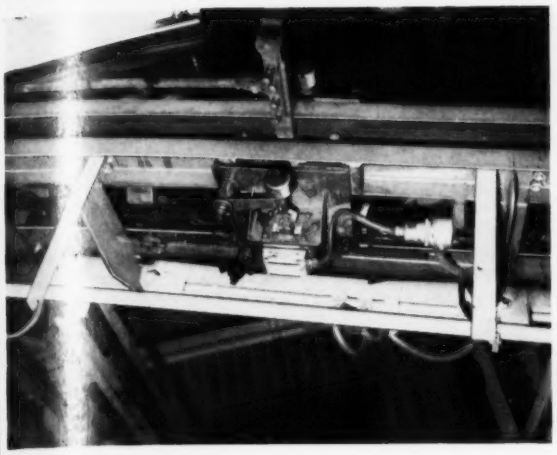

Fig. 18. Electrical indexer

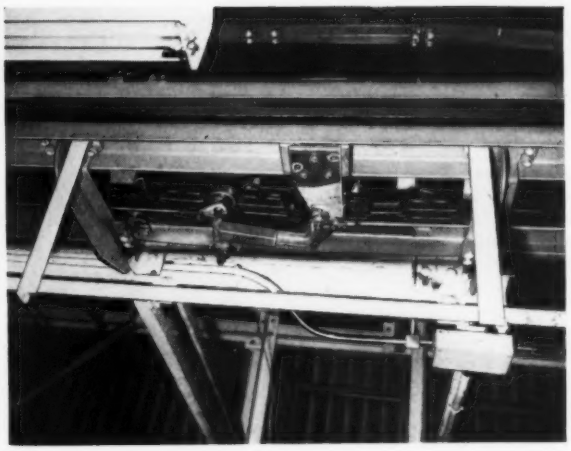

Fig. 19. Mechanical indexer

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Fig. 20. Transfer section

Fig. 21. One of the electromagnetic couplings used to control the speeds of the conveyors

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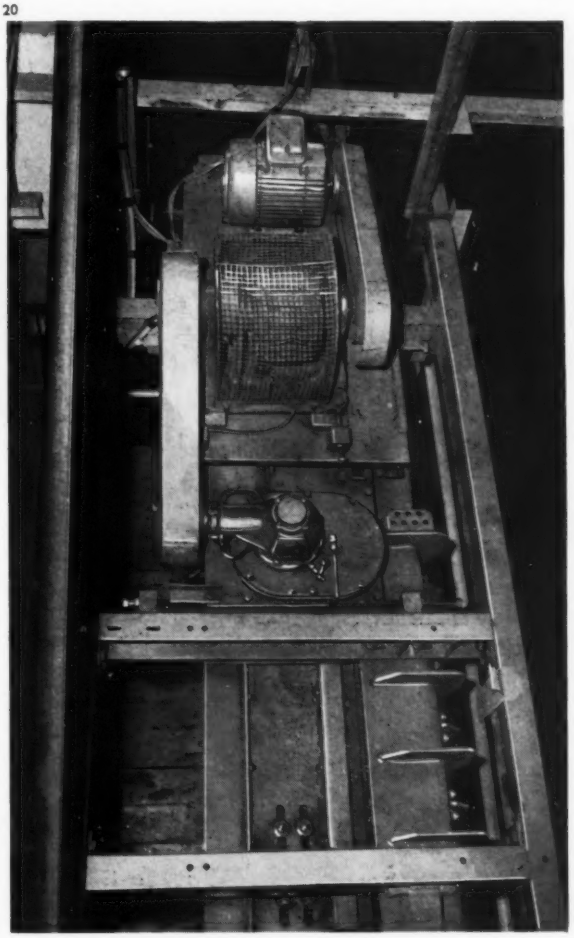


hand, by which the bodies in white are raised to the level at which they can be picked up by the overhead conveyor and the painted bodies are lowered to the lines for body trim, are hydraulically operated. The load these sections carry is variable up to a maximum, for either the upward or the downward movement, of approximately 6,800 lb (3,084 kg).

Speed of operation is 29 ft (8·8 m)/min for lowering, and 26 ft (7·9 m)/min for lifting, and this speed has to be related precisely to the dwell of the overhead conveyor.

Filtered oil is supplied from a reservoir and pressurized by a gear pump driven by a 10-h.p. electric motor. Maximum pressure is limited by the setting of a relief valve, and this valve, operating in conjunction with the speed-control valve, governs the speed of the hydraulic cylinder. Excess oil is returned to the reservoir.

Speed and directional control are exercised by solenoid-operated directional valves. The circuits are so arranged

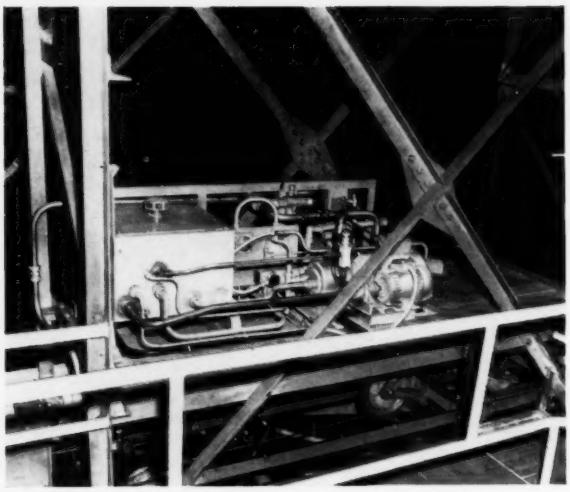


Fig. 22. Hydraulic gear for the operation of one of the drop-sections

that the ram will travel at full speed or slow speed when the appropriate solenoid is energized and either speed can be set by an adjustment provided on the speed-control valve. A release valve in the oil line to the hydraulic cylinder is preset to counteract the load, with the result that the cylinder has to be driven downward.

Included in the circuit is a small-capacity holding pump, which operates continuously in such a way that when the cylinder is in the up position, and the solenoids are de-energized, pressure is maintained continuously upon the full area of the cylinder bore, thus preventing any tendency to creep. Under this condition the main oil flow is returned to the tank and excessive heat cannot be generated in the system. The working pressure of this pump is governed by a relief valve, and is adjustable to suit varying conditions.

It has not so far been found possible to install separate drop-sections for each of the two body-types, either for the lift from assembly to paint shop, or for the downward movement of the bodies from paint shop to trim. But the lifting yokes were designed by Simca to suit both types of body and can be set in position by two men in a very few seconds.

So far as the outside contract is concerned, the paint-shop handling system is an all-British achievement, the responsibility for which was undertaken by Geo. W. King Ltd. King *Dual Duty* conveyors were used for the 27,000-ft (8,200-m) overhead network of conveyors. E.M.I. Ltd., Southall, provided the electronic equipment associated with speed compensation and the signalling of the release of bodies from convergent conveyors. The Heenan dynamatic couplings used for speed control, automatic speed-compensation, synchronization, and speed proportioning, were supplied by Heenan & Froude, Ltd.

Keelavite Hydraulics, Ltd., designed and supplied the hydraulic equipment in the lift sections, which was assembled from their standard units. Automatic control gear throughout the installation was supplied by Donovan Electrical Co., Ltd. The control pulpit from which bodies are selected for entry into the paint shop, and the related equipment, was designed by the engineers at the Simca works.

The author is indebted to the directors of Simca for facilities afforded for visiting their Poissy factory and investigating their production methods.

Fig. 23. Electronic control gear for the electrodynamic couplings

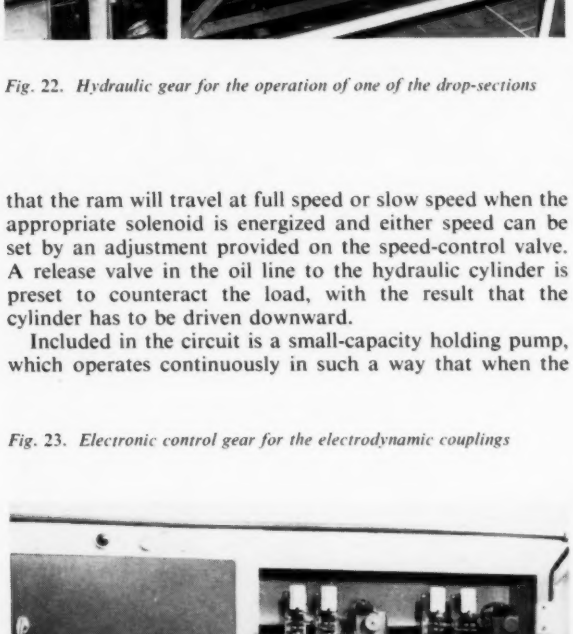
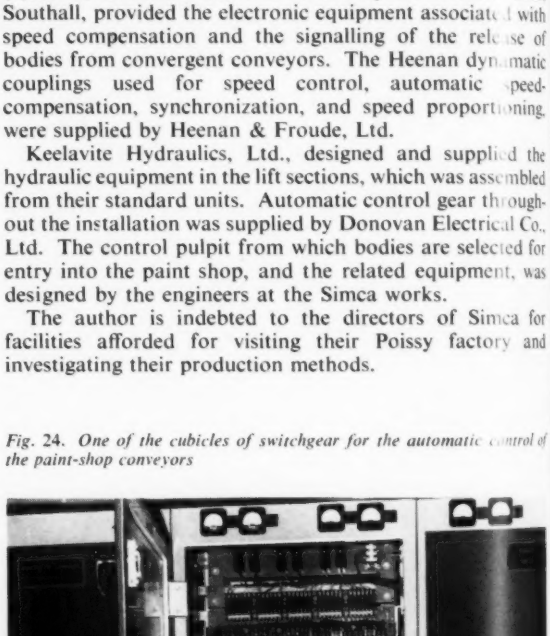


Fig. 24. One of the cubicles of switchgear for the automatic control of the paint-shop conveyors



FORK TRUCKS SAVE TIME AND SPACE IN ICE-CREAM STORE

By a Special Contributor

Some of our leading fork truck manufacturers have been quick to see the advantages to be gained by palletization in the cold-stores that are springing up everywhere, and to undertake the development necessary to exploit the potentialities of a vast new market.

Speed of handling and economy in the use of space are of even greater importance in the cold-store, which is expensive to build and to operate, than they are in the ordinary warehouse. On both these counts, the palleted unit-load, handled and tiered mechanically, is clearly indicated as the most appropriate method of storage. Sub-zero temperatures, which had during an earlier period created problems for the conveyor manufacturers, had to be faced and fought along a new front by the makers of fork lift trucks, in which hydraulics play such an important part, and some time has been spent in finding the most effective means of combating the adverse effects upon the hydraulic system of condensation and corrosion. These and other difficulties have now been overcome by manufacturers in Britain and other countries, and the machines they have developed may safely be used in temperatures down to −20 deg F. Once again in the history of an industry that owes its quick growth to the co-operation of its clients, such development has been given the necessary encouragement by companies like T. Wall & Sons (Ice Cream), Ltd., who have made a careful study of the many problems associated with sub-zero temperatures and explored all new methods and equipment that could improve the efficiency of their operations and promote the best possible quality/cost ratio for their product.

Having satisfied themselves that the technical difficulties had been overcome and the method was economically justifiable, Wall's decided to go over to palletization in all their new cold-stores. The system they have adopted was seen in operation on their factory premises at The Friary, Acton, London, W.3, in a building designed for the purpose, where it has been functioning satisfactorily for more than half a year.

Acton is the ice-cream manufacturing and distributing centre for the southern region and one of the four distributing centres for Great Britain—the others covering the western, northern, and Scottish regions. It serves many depots in an area extending from the Wash to the Solent and deliveries are also being made from Acton to the new cold-store at Gloucester.

The palletized cold-store at Acton was built recently to supplement a conveyorized cold-store that has been in existence for some eight years. It came into use in the second week of December 1959. The building is 200 ft long and as nearly square as the site will permit, and is erected on sleeper-walls, with the floor suspended 4 ft above the ground as a precaution against frost-heave. Like all cold-stores it is of extremely expensive construction on account of the high degree of thermal insulation required; a layer of cork of at least 12-in thickness is incorporated in all the outer surfaces to reduce heat-transference.

Fig. 1. Trolleys laden with cans of Wall's ice-cream are transported over the bridge from factory to cold-store by a Pantin steel-slat conveyor, while the return strand takes back an empty trolley

A temperature of −18 deg F is maintained inside the building and the effective coldness is increased by a 3-m.p.h. air-blast. If it is accepted that a forced draught of 1 m.p.h. is equivalent in chilling effect on the human body to a temperature-drop of 5 deg F, the body-chilling effect of the air in the cold-store may be assessed at 65 deg of frost.

Except for a mezzanine floor, the store is a single-storey building providing an effective stacking height of 18 ft with clearance to the underside of the piping through which the refrigerant is circulated. It is separated from the factory by a roadway, and the mezzanine floor extends inward from the wall facing the factory to form an open platform across the end of the building.

Ice-cream leaves the packaging end of the production lines on a conveyor, which, on emerging from the factory building, is carried on a bridge to the cold-store. Here it is discharged on to the mezzanine floor through an aperture in the wall. Stock for despatch is loaded on to road vehicles

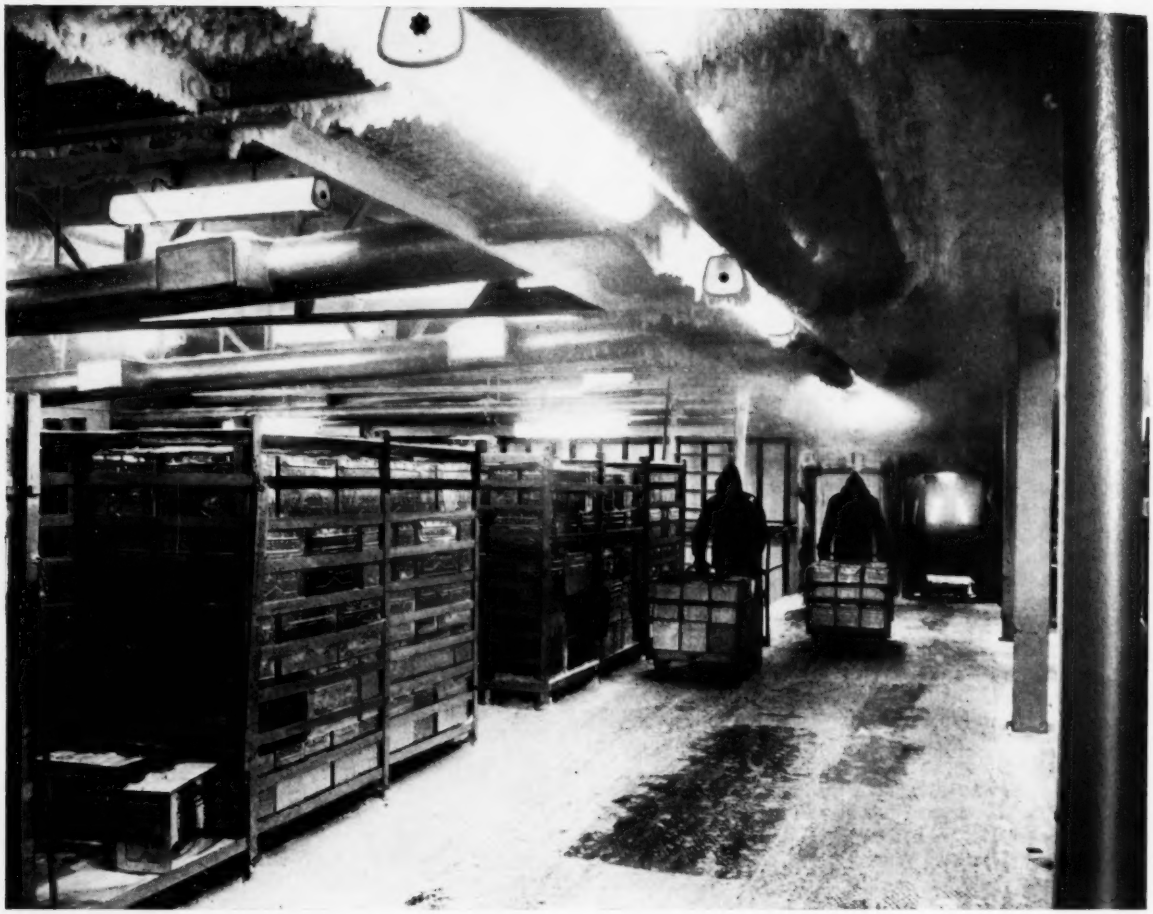


Fig. 2. On reaching the cold-store the trolleys come to rest on their wheels and are pushed through the rubber doors and curtains and on to the mezzanine floor

through outlets in the adjacent wall. All inlet and outlet openings are fitted with rubber doors and curtains to reduce heat-transference and access for personnel and trucks is through an airlock and heavily insulated doors.

There is little difference in temperature between the mezzanine and ground-floor areas, on account of the equalizing effect of the air-blast, and except over a small area near the openings in the outer walls, there is no visible sign of condensation. The atmosphere is clear; the store is illuminated—surprisingly—by fluorescent tubes; and in every corner the lighting is of uniform excellence.

Before leaving the factory the ice-cream is packed in rectangular aluminium containers known as 'cans'; the 'portion', which is equivalent in size to a briquette, being the name used in the trade to denote the typical unit of ice-cream. The cans are loaded on to 4-wheeled galvanized steel trolleys and the trolleys, each with a complement of 14 cans, are pushed on to a steel-slat conveyor and carried over the bridge to the cold-store. When the trolley is on the conveyor its base rests on the steel slats, but, as it enters the cold-store, the conveyor is carried round the sprocket and falls away and the wheels of the trolley come to rest on the floor of the building at mezzanine level.

Inside the store, the trolley is wheeled away and its contents are transferred by hand to pallets. The empty trolley is then brought back to the bridge and carried on a return conveyor back to the factory.

Henceforth, while in the cold-room, the cans are stored on box-pallets of galvanized steel having three slatted sides and hinged bars on the fourth side, which can be swung downward to give access for loading and unloading. The pallets are all of uniform size, standing 6 ft high, weighing 3 cwt, and capable of holding 50 cans. They are marked with a colour-code to indicate their contents and loaded accordingly from the trolleys—no pallet being used for more than one line. The cans have open tops, which enable the operator to see and classify the contents at a glance from the wrapper colour-code as he lifts them off the trolley. The cans themselves can thus be identical, without any distinguishing marks. This arrangement simplifies the work at the packing end while yet enabling stock to be selected quickly and easily for despatch.

When fully laden, the pallets are taken by hand truck to the edge of the platform formed by the mezzanine floor, from which they can be lifted down by fork trucks operating on the floor below. The trucks are of 2,000 lb capacity. On and under the mezzanine floor the pallets are not tiered, but elsewhere in the cold-store they are stacked three units high to make full use of the 18 ft of headroom. Five trucks work continuously for two 9-hr shifts, bringing down the loaded pallets, putting them away on the floor below, and, in the afternoon, bringing them forward for loading at the bays and returning the empty pallets to the mezzanine floor.

Fig. 3. The open-topped aluminium cans are placed according to their contents on the appropriate post-pallet with colour-code marking

Fig. 4. Laden pallets are lifted down from the mezzanine platform by Coventry Climax fork trucks and stacked on the ground floor to a height of 18 ft

Fig. 5. Single pallets are accommodated in the area below the mezzanine floor. As pallets are emptied for loading into delivery vans, they are returned for filling with incoming stock

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Economy of space in the insulated vehicles by which the ice-cream is taken to the depots, and also because most of the depots are not equipped for handling pallets and, if another reason is not redundant, because bulk has sometimes to be broken *en route*, the cans of ice-cream are removed from their pallets and packed solid in the vans. They are transferred from store to van at three loading bays by retractable roller conveyors, which pass through rubber curtained openings in the wall of the store and on to the floor of the rear opening vans.

The stilts on which the building is raised bring the floor of the cold-store to a convenient height above the floor of the vehicle as it stands on the ground and the final adjustment in level is made by means of a power-operated hydraulic jack fitted to the conveyor. The extension and retraction of the conveyor and the raising and lowering of the jack are controlled by push-buttons from the platform of the loading bay. Two men stand on the floor of the van and the containers are fed to them as they proceed with the stacking, working from the front-end backward with the conveyor retracting as they go. The bodies were built to Wall's design, to fit the can module and are packed without wasting a cubic foot of space. One of the 20-ton 8-wheelers that have been added recently to the fleet will accommodate a payload of 2,000 cans.

In all the arrangements at this new cold-store, the detail work is good. Several points have been noted in the course of this description. Others would only become apparent as the work proceeded if the observer did a shift in the store. Watching others at work one might note the significance of the colours on the pallets, which, in addition to the coloured background and white letters signifying the contents of the cans, are marked with two red bars at the top and two yellow bars at the bottom. When the pallets are tiered the space for the entry of the forks of the truck is between the yellow band and the red, and the driver is guided automatically to the zone between the two blocks of colour—

Fig. 6. At the loading bays the cans are taken on to the floor of the van by a retractable roller conveyor

which, incidentally, are, unlike traffic lights, distinguishable by people who are partially colour-blind and could not tell the difference between green for safety and red for danger. Without these markings, a certain degree of strain would be imposed upon the driver by the effort of selecting the correct point of entry in the silver-grey mass presented by the galvanized pallets packed tightly with aluminium cans.

Ergonomics has been considered in these and other arrangements in relation to the abnormal reactions of human beings when subjected to sub-zero temperatures. Individual differences are pronounced under these conditions, but Wall have designed their codes of practice on the basis of the extreme cases, in which reactions may be extravagantly decelerated, and judgment impaired, or there may be a resistance to suggestion or instruction, or a tendency towards irritability or aggressiveness. The onset of such symptoms is prevented by insistence upon adequate precautions.

In the first place, all men working in the cold-store are protected against the cold by a £30 outfit designed for Wall by a firm specializing in the equipment of Everest expeditions. It consists of a combination suit that is light in weight but high in thermal-insulating properties, a helmet, gloves, shoes with thick insulated soles, and a woollen scarf of superlative softness to cover the mouth. Before being engaged for the work, each man must pass a special medical examination in addition to the regular examination specified for all employees, and is afterwards kept under observation throughout his period of service in the cold-store. The detailed records kept by the company are being studied with interest by research workers and are furnishing them with useful data for application in many low-temperature fields.

The health-record of the men is excellent. They never get colds. Many of them would be perfectly happy to remain in a sub-zero temperature throughout the day. But, however comfortable he may feel, a man is only allowed in the cold-store for a spell which must be followed by a rest in normal temperature for a short period. The work itself is made as easy as possible by the attention to detail that has been noted, and by a corresponding thoughtfulness in the choice of equipment.

Of first importance in this connection is the selection of the fork lift truck, which was made as a result of prolonged trials of machines of this type and of various competitive makes in Wall's factory at Craigmillar, Scotland. The model chosen is the IGET battery-electric fork truck manufactured by Coventry Climax Engines, Ltd., in which the designers have incorporated special modifications for operation in temperatures down to — 20 deg F. These are additional to the truck's standard characteristics of mobility, stability, and ease of control, that can be relied upon to reduce the onset of fatigue in the driver.

Batteries are changed once during every 9-hr shift, and, apart from their journeys to and from the charging room, the machines work continuously in the cold-store for 18 hours a day. They have been in operation since the second week in December, 1959, and, save for the development of a slight oil-leak which was cured by replacing the seals, have given no trouble.

The three retractable conveyors in the loading bays were supplied by The British Wedge Wire Co., Ltd., London, and are fitted with hydraulic jacks made by Power Jacks, Ltd. The chain-driven steel-slat conveyors carrying the wheeled trolleys from and to the factory were manufactured and installed by W. & C. Pantin, Ltd.

The courtesy of the directors of T. Wall & Sons (Ice Cream), Ltd., in affording the facilities to visit and photograph their cold-store and collect information for the purposes of this report is gratefully acknowledged.

Fig. 7. Almost every cubic inch of space inside this 20-ton insulated van is taken up by cans. Inclination of the British Wedge Wire retractable conveyor is adjusted by means of a Power Jacks hydraulic ram

FULLY AUTOMATIC HEAT TREATMENT LINE

CLAIMED as the first in Britain, a completely automatic heat-treatment line for carburizing, annealing, hardening and tempering has been installed by AEI-Birlec, Ltd., at British Timken's Daventry East Works. The equipment has been built primarily for the heat treatment of tapered roller-bearing cups and cones for vacuum-brake rolling stock required under the railway modernization scheme.

The processes, which are in automatic sequence, are performed in four Birlec furnaces. The furnaces are linked by mechanical and hydraulic handling devices designed by British Timken to meet their specific requirements. The installation performs the following processes:

1. Gas carburizing; 2. Sub-critical annealing; 3. Hardening; 4. Tempering.

Prior to heat treatment, cups and cones are stored in multiple units. From there they pass through a washing machine to the furnace operator's loading station. The components are loaded by hand on to locating fixtures manufactured from high-grade cast nickel-chromium alloy. The loaded fixtures are assembled four at a time on nickel-chromium trays, three of which form a furnace charge at every loading sequence. Once the components are loaded on to the trays, their progress through the complete heat-treatment cycle is fully automatic. No further manual operations are required until the components are unloaded on emergence from the tempering furnace.

Fig. 1. A view of a Birlec gas-fired triple-track pusher-type furnace rated at 3,500 cu. ft./hr and leading into a single track with intermittent pusher furnace

Continuous Gas Carburizing Furnace

Three loaded trays simultaneously enter the vestibule of a continuous carburizing furnace. The furnace is heated by gas-fired radiant tubes arranged in four zones, each under independent and automatic temperature control. The first of these is a heating zone, the middle two are soaking zones, and the fourth is a diffusion zone. The total cycle time in the heating chamber is 24 hours, and the furnace has a capacity of approximately 500 lb/hr.

A controlled carburizing atmosphere is supplied to the furnace by an adjacent Birlec endothermic generating plant.

Fig. 2. A 120-kW Birlec roller hearth hardening furnace installed at the Daventry Works of British Timken

Propane enrichment of the atmosphere is regulated by a Foxboro-Yoxall dewpoint controller.

The trayloads of bearing cups and cones that comprise a furnace charge are aligned along a triple track. They progress through the furnace by a sequence of synchronized pushes from hydraulic cylinder mechanisms located at the charge end of the furnace. While, at present, identical time cycles operate on the three tracks, appropriate sequence equipment has been incorporated to enable different time cycles to be used on the individual tracks.

The heating chamber is 31 ft 6 in long and has a cross section measuring 6 ft 4 in wide by 1 ft 6 in high. Safety features have been provided so that, in the event of a power failure, the outer furnace doors rise automatically, and the furnace is shut down in a 'fail-safe' manner.

At the discharge end of the furnace, a further hydraulic pusher moves one tray at a time in sequence from the three tracks on to a platform. The platform is then lowered automatically into an oil tank to quench the charge. Next, the loaded tray is transferred by a motor-driven chain conveyor through a washing station. After passing through the two compartments of the station, one for spray wash and the other for a hot-water rinse, the work tray is transferred automatically to the loading mechanism of the sub-critical annealing furnace.

Sub-critical Annealing Furnace

The second furnace in the installation, for sub-critical annealing, is an electrically heated pusher-type furnace. Rated at 145 kW, it is heated by well-mounted tape elements arranged in three zones. Cups and cones are annealed in the furnace governed by the automatic cycle of the carburizing furnace. An exothermic generating plant supplies a protective atmosphere to the heating chamber. After annealing the trays are discharged singly from the furnace and quenched, washed, rinsed and dried in a manner identical to that employed for carburizing.

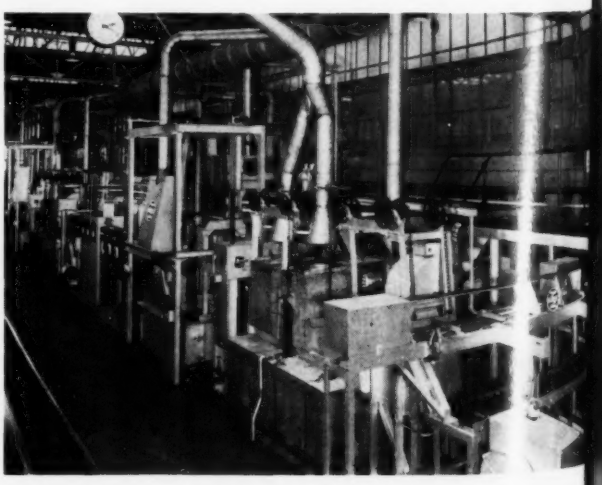
At this stage in the heat-treatment cycle, the components are 'de-stacked' from the tray and delivered to conveyors loading the hardening furnace. 'De-stacking' is performed by two sets of air-operated fingers projecting from an overhead trolley. The stacks of cups and cones are lifted off the tray fixtures, and released in pairs on the conveyors. In the second stage of this operation, the turntable supporting the tray is rotated through 180 deg. The trays and fixtures thus emptied are returned to the charge end of the carburizing furnace by a chain-driven pusher and conveyor.

Hardening Furnace

Bearing ring components after sub-critical annealing in the pusher furnace are transferred to a Birlec roller hearth furnace for hardening. The conveyors feeding the hardening furnace each carry forward a component which is deposited on the furnace track by a twin lever mechanism synchronized with the opening of the charging door.

The heating chamber, which measures 18 ft long internally,

Fig. 3. This view of part of the continuous line for tempering, annealing and hardening shows a Birlec sub-critical annealing furnace in the foreground. This unit follows on from the Birlec triple-track pusher gas-carburizing furnace



is electrically heated by nickel-chromium alloy tape elements in the roof and by cast grids in the hearth. There are two heating zones in the furnace, with a total rating of 120 kW, and each component completes the hardening cycle in approximately an hour. The furnace is provided with an atmosphere from an adjacent endothermic generating plant of type similar to that feeding the carburizing furnace.

The rollers forming the hearth of the furnace are arranged in a number of sections. Each section is individually driven from a main shaft running longitudinally at one side of the furnace, just above floor level. At the discharge end of the furnace, the last section of rollers is fitted with an overdrive for fast discharge. Two photo-cell units control the operation of the fast roller drive gear and the discharge door. On completion of the necessary soaking time in the hardening furnace, the discharge door is opened to allow a pair of components, as detected by the photo-cell, to be discharged by the fast rollers. On emergence, the components are turned by deflecting ploughs through 45 deg to a pair of jig quench machines.

Pneumatic devices position the components against adjustable stops on the quench plates of these machines. Controlled quenches are then performed by the operation of air-hydraulic rams carrying jig plugs. These locate in the bores of the components during quenching and minimize distortion during the operation. A high rate of flow of quench oil is maintained for a predetermined period. The press ram then rises and the components are discharged along chutes and conveyors to a further washing machine.

Tempering Furnace

After washing, cups and cones are aligned in a mechanized handling device which feeds the components across the width of a continuous tempering furnace. This device positions the cones inside the cups before entering the furnace.

Tempering, which is the final stage of the heat-treatment operation, is carried out in a continuous Birlec slat conveyor furnace rated at 48 kW. The furnace chamber, 15 ft in length, is heated by special electric elements fitted in the side walls and arranged in two zones.

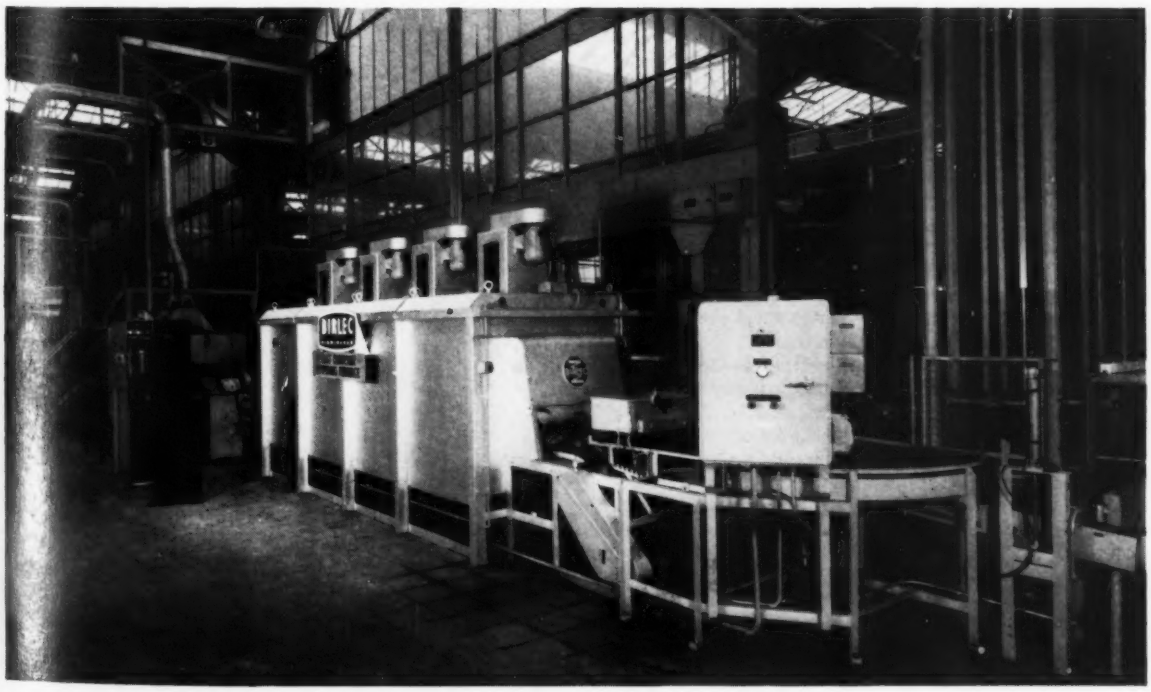
Components travel through the furnace on a series of steel slats supported by roller chains which engage sprockets at the ends of the frame. To promote convection heating, the slats are perforated and a vigorous air flow through the load is maintained by four roof-mounted fans. At the discharge end of this furnace, cups and cones are separated by another handling unit which so positions the components that they fall into two separate chutes. From these positions the components are fed on to two wire-mesh belt conveyors to stacker storage units identical to those preceding the heat-treatment line. These units provide the storage of components prior to grinding.

By the correct selection of quenching operations with this continuous installation of atmosphere furnaces, it has been possible to minimize the formation of scale on components during heat treatment. Indeed, there is no necessity for any form of shot-blasting operation. Furthermore, by incorporating washing, rinsing and drying operations, degreasing of components has been avoided.

The supply of quenching oil to the three quenches in this installation, as well as to the roller heat-treatment installation, is obtained from an oil service house on the west wall of the factory. In this building three 6,000-gal capacity oil tanks and multiple pumping sets are housed. Thermostatically controlled Heenan & Froude coolers mounted on the roof maintain the correct oil temperature.

Throughout the whole of this installation and the roller heat-treatment installation, the extraction of fumes and waste gases from the furnaces and washing machines has been afforded by a system of exhaust trunking supplied by the Modern Air Co. This trunking unites all points of fumes and gas escapement in the installation to a common junction extending through the west wall of the factory, and thence to a fan unit mounted on the roof of the oil service house.

Fig. 4. The 48-kW Birlec slat conveyor tempering furnace



OVERHEAD CRANES WITH PNEUMATIC TYRES

With the use of standard tyres it is claimed that cranes up to 30 tons can be modified

BELIEVED to be the first of their kind in the world, two electric overhead travelling cranes, mounted on pneumatic-tyred wheels, have now been in intensive operation for over six months at the Aylesford Paper Mills of the Reed Paper Group.

Overhead travelling cranes have been in use for several hundred years. During the past 100 years long travel speeds have increased tremendously—from 25 ft/min to 400 ft/min. This increase in speed by nearly 20 times, together with the accompanying improved acceleration and braking, has induced higher stresses in the cranes and their supporting structures. These in turn have been strengthened to withstand the more severe conditions, thus increasing the masses involved and further aggravating the situation.

Certain troubles have become evident and remedial measures have been introduced from time to time. The main problem which has confronted crane operators for some years has been cross-binding. This is caused by the crane trying to run askew the track so that the wheel flanges bind on the faces of the rail. To alleviate this difficulty, which results in rapid wear of the rails or the wheels, lubricators have been designed to apply special greases or graphite to the sides of the rail head.

An alternative method which has been used is the cutting of the wheel treads to a special profile, as is done in railway practice. In Germany the same problem has been tackled by removing the wheel flanges and mounting guide rollers on the crane which bear on horizontal tracks beside the gantry rails.

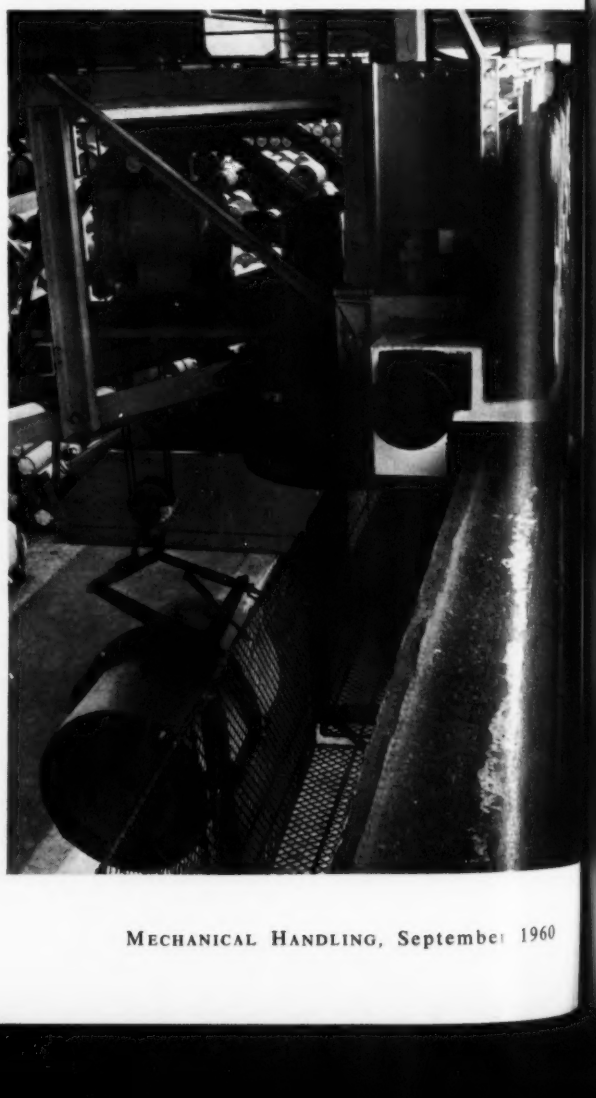
An important step in considering the crane and the building as an integrated problem was made at the Crane Makers' Conference in Harrogate in 1955, when W. S. Atkins & Partners, consulting engineers, proposed a new development in this field—the mounting of electric overhead travelling cranes on rubber tyres. This radical step can be compared with that of 100 years ago when the prime mover was first mounted on the crane itself.

The main problem in crane motion is steering, and at first sight this may seem a paradox since cranes are normally required to travel in straight lines. However, in principle, the design of the long travel transmission has been based for over 100 years on the assumption that two wheels constrained to rotate at the same speed—that is mechanically interconnected by shafting and gearing—will travel the same distance. A further assumption has been that the rails on which the crane is travelling are straight. Both these precepts demand considerable effort to obtain and, what is more important, to maintain them. The first requires that the diameter of the wheels shall remain constant and that the wheels shall never skid; the second, that the gantry track, and hence the building, shall be initially straight and shall not be likely to change shape under any circumstances.

As speeds have increased, attempts to satisfy these ideals have become increasingly costly, and have resulted in both cranes and buildings becoming more rigidly constructed. Furthermore, the increased speeds, more powerful motors and greater rigidity have all contributed to increase the forces induced between the rails and wheel flanges when a crane runs askew.

If a side force is applied to a rolling wheel it will drift at

Fig. 1. In this view the five pneumatic-tyred wheels on the end-carriage can be seen together with one of the solid-tyred guide wheels



an angle proportional to the elasticity of the material from which it is made. The elasticity of steel is so small that the drift is negligible compared with the requirements of practical crane engineering. By using a material having a greater elasticity, such as rubber, the drift for a given force is much greater and, conversely, for a given lateral deviation the force is much less. Thus, a crane mounted on rubber tyres can be run on a track having variations in gauge and line which are of a different order from those which would be tolerated by a crane on steel runners. For example, on a test track a vertical step of 1½ in and a distortion in the track equivalent to a lateral displacement of 4 in of one building column in relation to adjacent columns produced no difficulty in long travel motion.

The benefits of this development are cumulative. The end carriage assemblies and long travel transmission of the crane can be built using heavy automotive principles rather than railway design practice. The reduction in weight of the crane and the elimination of impact effects allow lighter gantry and foundation construction and hence the cost of the building is lower.

Development work included some three years of theoretical study to determine the dynamic implications and to devise methods of guiding the crane now that the wheels had become flangeless. Strachan & Henshaw, Ltd., the crane manufacturers, realizing the importance of this technical break-through, collaborated with W. S. Atkins & Partners and established test facilities at their Bristol factory, where the theoretical work was confirmed and necessary development testing carried out.

The Finishing Department at the Reed Group's Aylesford Paper Mills was erected nearly five years ago. The latest type of reinforced concrete construction with a barrel-vault roof, which has among other advantages good insulation and heat-conservation qualities, was selected for the building. The intense operation cycle demanded from the cranes, partly because of continually increasing throughput, accentuated the problems associated with running steel-wheeled, overhead cranes on gantry rails at high speed when considerable long travelling is involved. Accordingly, Reeds took the opportunity to improve the operational efficiency of the cranes by mounting them on rubber-tyred wheels when this idea was put forward by W. S. Atkins & Partners.

The two cranes concerned handle the entire output of reeled paper from four papermaking machines, which manufacture wrapping papers, tissue papers and newsprint. They have a nominal span of 69 ft 6 in and a lifting capacity of two tons, which may be increased to three tons by the installation of a larger hoist-motor.

Each end-carriage is supported by five pneumatic-tyred wheels—standard commercial-vehicle-type tyres (Michelin X 7.00-20)—together with two horizontally mounted solid-tyred wheels which bear on the sides of the concrete runways to keep the cranes running in a straight path.

Disc brakes are fitted to two of the pneumatic wheels of each end-carriage assembly, and a 7-5 h.p. electric motor drives one other pneumatic wheel through reduction gearing.

Use of rubber tyres has provided an additional advantage —although it is intended that each end-carriage be driven by a separate electric motor, in an emergency the crane can be operated with only one motor driving one side of the crane. This would be impossible with a crane having traditional steel wheels.

Before conversion, the original end-carriage of the cranes at Aylesford had steel wheels which ran on rails grouted to the top of the concrete gantry beams. The conversion consisted of fitting redesigned end-carriages and removing the rails, with the result that the rubber-tyred wheels now travel on smooth concrete runways.

As a result, the speed of the cranes has been increased from 300 ft to 360 ft/min, and it is possible to further increase the speed to 400 ft/min if desired.

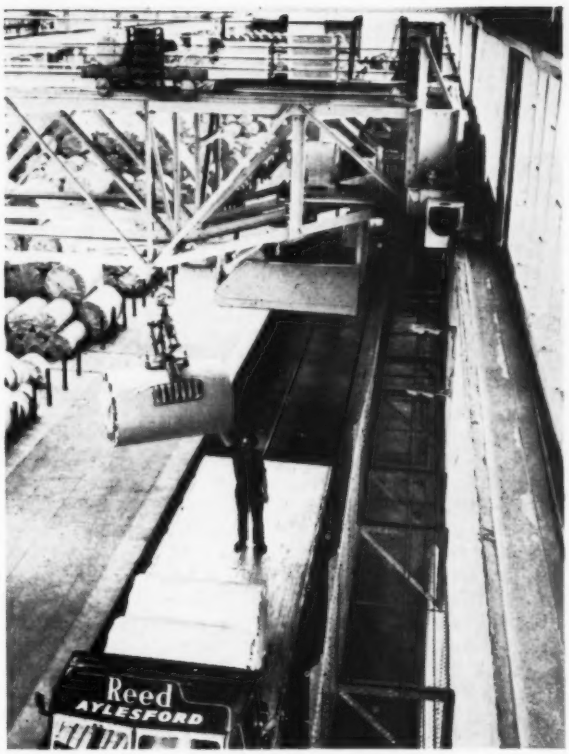


Fig. 2. The cranes run on smooth concrete runways previously occupied by steel rails

Acceleration to full speed can be accomplished in six seconds, and the crane—which is fitted with disc brakes—can be brought to a standstill from full speed in 6 ft.

Access platforms are provided for servicing the motors and inflating the tyres. Gauges are mounted on each wheel to simplify routine checking of tyre pressures, and screw jacks have been incorporated in the end-carriage to facilitate wheel changes.

With the use of standard commercial tyres, it is claimed that electric overhead travelling cranes up to 30 tons can be modified relatively simply, and fast, intensively operated production cranes are particularly suitable for conversion. Several new designs have been projected, including a 10-ton semi-goliath for use in the machine shop of a steel mill.

Undoubtedly, the trend during the next decade will be towards the increasing introduction of rubber-tyred cranes. This will enable the increasing of the load-carrying capacity of existing gantry cranes because of the elimination of impact problems. The development will also enable the speeds of existing cranes to be increased.

Consulting Engineers and Contractors

Consulting engineers:	W. S. Atkins & Partners
Main contractors:	Strachan & Henshaw, Ltd.
Pneumatic tyres:	Michelin Tyre Co., Ltd.
Solid rubber-tyred wheels:	Andre Rubber Co., Ltd.
Disc brakes:	Dunlop supplied by Twiflex Couplings, Ltd.
Motors:	Crompton Parkinson, Ltd.
Reduction gearboxes:	Crofts (Engineers), Ltd.

NEWS OF

PERSONALITIES

L.C.E., Ltd., the recently formed electronics firm jointly owned by Joseph Lucas (Industries), Ltd., and the Collins Radio Company of America, announce that **Lord Halsbury** of Joseph Lucas (Industries), Ltd., is chairman of the board, and **Jonathan H. Lasley** of Collins Radio Co. of England is vice-chairman. Other directors include **C. F. Finch, James G. Flynn, Jnr., F. C. Huston, R. C. Frost** and **C. W. Griffiths.** In addition, **Kenneth Jones** has been appointed a director and general manager of L.C.E., Ltd.

The Goodyear Tyre & Rubber Co. (Gt. Britain), Ltd., announce two important executive changes in their Industrial Products Sales organization. **W. U. Chapman,** who has for the past 16 years been manager of Goodyear Industrial Products Department, has been transferred to the Export Sales Division of the company; his comprehensive knowledge of this field will be applied to dealing with specialized Industrial Products export matters.

J. T. Pearson succeeds Mr. Chapman as manager, Goodyear Industrial Products Department, and brings very considerable financial, organizational and commercial engineering experience to this appointment.

J. T. Pearson

W. U. Chapman

Owing to the great expansion in the sale of Hyster and Hyster/Ransome lift trucks, cranes and tractors, Fred Myers, Ltd., announce that a new company, Fred Myers (Industrial), Ltd., has taken over this side of the business.

A. N. Dixon, the chairman of this new company, announces that **A. F. Stevenson** has been appointed general manager.

P. A. Kingston, who was formerly head of the company's Caterpillar parts department, is now the general parts and service manager of Fred Myers (Industrial), Ltd. Area manager for the Midlands, Wales and South West England is **V. G. A. Upton,** who was until recently with Yale & Towne Manufacturing Co. **M. A. L. Metcalfe,** who has been senior sales representative for the past three years in London, now takes up the position of area sales manager and as such will be responsible for sales activities in London and the South East and North East of the dealership. **R. D. Wright** has joined the sales staff and taken up the appointment of sales representative covering Essex, East London and eastern areas of Hertfordshire, Middlesex and Bedfordshire.

F. W. Bates, works director of Kelvin & Hughes, Ltd., Ilford, Essex, has been awarded the O.B.E. in the Queen's birthday honours list for services rendered to instrument production.

T. H. Kelsey, whose appointment as assistant general manager of the Witton Engineering Works of The General Electric Co., Ltd., was announced in October, 1958, has now been appointed deputy general manager to J. J. Gracie, director of the company, and general manager of Witton Engineering Works.

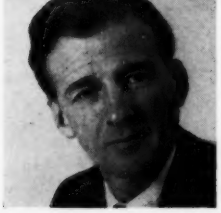
British Insulated Callender's Cables, Ltd., have appointed **B. Hollingworth, A.M.I.E.E.,** to the position of assistant sales manager (mining) in succession to **J. A. Rodgers,** who is now divisional sales manager (accessories).

Bowmaker, Ltd., announce the following appointments arising from the continued development of their branch organization throughout the U.K.: **J. S. Tunbridge** appointed resident representative of a new office at Measham, Burton-on-Trent; **J. S. D. Cook** appointed resident representative of a new office at Dumfries; **A. B. Godfrey,** hitherto resident representative, promoted to sub-manager of Weston-super-Mare branch; and new premises for the Gloucester office are under the direction of **A. T. Coles,** branch manager.

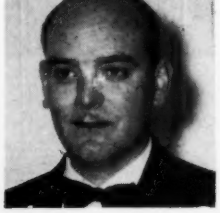
Owing to the pressure of his other business interests **Sir Graham Hayman** has relinquished the chairmanship of BTR Industries, Ltd., but retains his seat on the board. The directors have unanimously elected **Sir Walter Worboys** as chairman of the company.

K. A. Lowe, B.Sc.(Eng.), A.C.G.I., A.M.I.Mech.E., and **R. D. Harvey, A.M.I.Mech.E.,** recently left London Airport for Tokyo to take up appointments in Japan. Mr. Lowe is chief resident engineer for the construction of the 150 MW nuclear generating station at Tokai-Mura and Mr. Harvey

(*Continued on page 625*)



A. N. Dixon



A. F. Stevenson

P. A. Kingston

V. G. A. Upton

M. A. L. Metcalfe

is the deputy chief engineer (electrical and mechanical) of the British General Electric Co. of Japan, Ltd.

Birtley Engineering, Ltd., a subsidiary of the BSA Group, announce that **F. Jordison,** chief engineer and manager, Materials Handling Department, has been made a director.

H. R. **Brunyee,** at present works manager (services) at the Steel Peech and Tozer branch of The United Steel Companies, is to retire on July 31st, 1960 and he will be succeeded by M. Thomas, who is at present assistant works manager (services).

A. M. **Champion, M.B.E.,** has been appointed manager of Perkins Engines, Ltd.'s vehicle engines sales branch. **L. C. T. Roberts, M.Inst.B.E., Assoc.I.E.E.,** has been appointed assistant manager of Perkins Engines, Ltd.'s industrial engine sales branch.

M. R. Moore

C. W. Allin

Matthew **Reid Moore,** who became general sales manager of Richard Sutcliffe, Ltd., Horbury, Wakefield, earlier this year, has now been promoted to the position of general manager.

Mr. Moore joined Richard Sutcliffe, Ltd., shortly after the war and was for ten years the company's district technical manager for the N. & C. and Durham Divisions of the National Coal Board and industrial representative for the North of England. Last year he was appointed manager of the company's Mining and General Products Division.

C. W. **Allin** has resigned from the board of Redler Industries, Ltd. and its subsidiary companies. At the time of his resignation Mr. Allin was joint managing director of Redler Conveyors, Ltd., and Conveyors (Readybuilt), Ltd., and his resignation severs a connection with this group of companies of nearly 26 years.

Mr. Allin was appointed to the board of Redler Conveyors, Ltd., in 1938, and became managing director in 1947. In 1953 he was appointed to the board of Conveyors (Readybuilt), Ltd., and in 1957 he was appointed joint managing director of the two companies. Mr. Allin, at the time of his resignation, was a member of the Executive Committee of the Mechanical Handling Engineers Association.

At the Degree Ceremony of the University of Bristol, recently, the Honorary Degree of Master of Science in Engineering was conferred on **G.W. Grossmith, M.I.Mech.E.,** chairman of Strachan & Henshaw, Ltd., Bristol.

G. W. Grossmith

J. Lowe

H. C. Hinder

Two important executive promotions were announced some time ago, and held over owing to pressure on our space caused by the Mechanical Handling Exhibition, by Bernard Christie, managing director of I.T.D., Ltd., Webb Lane, Hall Green, Birmingham.

H. C. Hinder, Southern area sales manager, becomes export sales manager, and **John Lowe,** Northern area sales manager, becomes home sales manager. Mr. Hinder and Mr. Lowe will be directly responsible to the managing director.

The appointments are made to meet the needs of the expanding business of the company. I.T.D., Ltd., are one of the leading manufacturers of fork lift trucks in this country, and the company is associated with the Austin Motor Co., Ltd., Crompton Parkinson, Ltd., and Clark Equipment International CA.

Mr. Lowe will be based at the head office at Hall Green, and Mr. Hinder at the London office, Water Road, Abbey Estate, Wembley.

B. A. Gomm has been appointed general manager of F. Perkins (Australia) Pty., Ltd., of Dandenong, Australia, a subsidiary within the Perkins Group, of Peterborough.

The Dowty Group announce the appointment of **Lionel Harper** as managing director of Dowty Hydraulic Units, Ltd. Mr. Harper was formerly managing director of Massey-Ferguson (Great Britain), Ltd.

Tube Investments, Ltd., announce that **W. W. Hackett, Snr., C.B.E.,** on retiring from the chairmanship of Accles & Pollock, Ltd., after 61 years' service with that company, which he helped to found, has accepted an invitation to become its first president.

Mr. Hackett was also a founder member of Tube Investments, Ltd., and served for many years as a director.

October

Among the feature articles, this issue will contain the following:

Extensive Mechanization at a Main Parcels Office

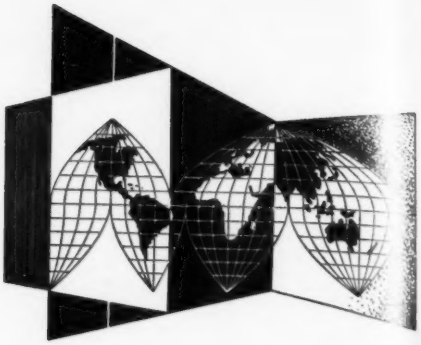
Complete Mechanization for handling cans and bottles at American Brewery

The Fast Production of Kitchen Equipment

Automatic Handling of Timber

and usual features

BRITISH MECHANICAL HANDLING EQUIPMENT OVERSEAS



British mechanical handling equipment is to be found working in most countries of the world. Each year since the end of the war, sales to overseas customers have increased. Buyers from overseas flock to the Mechanical Handling Exhibitions (organized by this journal) held every two years in London, so great is the regard for British-made equipment.

In this feature, to be continued each month, we shall bring you brief details and illustrations of such British equipment designed for, or at work in, countries abroad.

Overseas readers requiring information on any type of British mechanical handling equipment, or names of manufacturers' agents or representatives in a particular country, are invited to write to the Editor.

Britische Förder- und Hebegeräte befinden sich in den meisten Ländern der Erde im Einsatz. Seit Kriegsende steigern sich die Verkaufsziffern an ausländische Abnehmer von Jahr zu Jahr. Ein so grosses Ansehen geniessen Geräte britischer Herstellung, dass ausländische Käufer anlässlich der alle zwei Jahre von dieser Zeitschrift in London veranstalteten förder- und hebetechnischen Ausstellungen in Strömen herbeikommen.

In dieser monatlich fortgesetzten Artikelserie werden wir kurzgefasste Einzelheiten und Abbildungen britischer Geräte bringen, welche für das Ausland konstruiert bzw. dort bereits im Einsatz sind.

Ausländische Leser, welche an Auskünften über britische Förder- und Hebegeräte gleichwelcher Art, bzw. an Namen und Adressen der entsprechenden Hersteller, Agenten und Vertreter in irgend einem gegebenen Lande interessiert sind, werden gebeten, sich schriftlich an die Redaktion zu wenden.

←

NEW ZEALAND. *This Commer 7-tonner operated in New Zealand is fitted with a new type of locally built agitator. It is designed to carry 4 cu. yd., which is 1 yd greater in capacity than previous types. It is driven by a hydraulic motor through a pump mounted at the front of the engine on the base of the radiator. The agitator's turning speed can be controlled from within the cab or at the rear of the vehicle*

FINLAND. *At Koylio in Finland, farmers gathered to watch a soil-stabilizing demonstration of farm-road-making methods. This International Drott Four-in-one proved most versatile, being used to break up tough surfaces, carry and spread and smooth materials, compact and tamp the wet concrete and give the finishing pass. A British B-450 wheeled tractor with mounted Rotavator broke up the soil and mixed the soil and cement* ↓

Le matériel britannique de manutention mécanique se trouve en service dans la plupart des pays du monde. Chaque année, depuis la fin de la guerre, le chiffre des ventes à la clientèle des pays d'outremer s'est accru. Des acheteurs venus de tous les pays du monde accourent aux Expositions de la Manutention Mécanique (organisées par notre publication), qui ont lieu tous les deux ans à Londres, si haute est l'estime que l'on a pour le matériel de fabrication anglaise.

Dans cet article, à suivre tous le mois, nous vous présenterons des détails succincts et des illustrations du matériel anglais spécialement étudié pour et mis en service dans les pays étrangers.

Nous invitons cordialement les lecteurs de l'étranger à écrire à notre Rédacteur en Chef (The Editor) pous tous renseignements concernant un type quelconque de matériel anglais de manutention mécanique, ou les noms de fabricants, agents distributeurs ou représentants dans un pays donné.

NORWAY. *Ninety-six Goodyear E.420 V-belts are used to drive the new Norwegian ice breaker and salvage vessel m.v. 'Herkules'. Four marine engines each equipped with a 24 V-belt drive are used to power the vessel. Here, Norwegian engineers are checking the Goodyear V-belts on one of the drivers* ↓

GERMANY. *The s.s. 'Export' sailed from the Free Trade Wharf, London, bound for Rotterdam recently, with a shipment of ten Weatherill hydraulic loading shovels on board. The machines—six 14H and four 12H models—were destined for various contractors in Germany and Austria, where they will be used for operation in quarries, sand pits, gravel pits and for general contractors' work*

En la mayoría de os países del mundo puede hallarse funcionando equipo británico de manejo mecánico. Desde que terminó la guerra la venta de tal equipo a los compradores de ultramar ha venido aumentando sin cesar. Tan considerables es la estima en que se el equipo de fabricacion britanica en todo el mundo, que son numerosísimos los compradores extranjeros que se personan en Londres para visitar la Exposición de Manejo Mecánico (organizada por esta Revista) que se celebra cada dos años.

En esta sección, que aparecará todos los meses, les ofreceremos ligeros detalle- e illustraciones de tal equipo británico diseñado para países extranjeros o funcionando en ellos.

Los lectores de ultramar que requiran información sobre cualquier equipo británico de manejo mecánico, o el nombre del agente o representante de los fabricantes en cualquier maís en particular pueden escribir pidiéndola al Director de esta Revista.

NIGERIA. *A 72-in wide by 45-ft long pan feeder in the Fraser & Chalmers Engineering Works prior to despatch to Western Nigeria. This forms part of a contract for a limestone crushing plant for Nigeria* ↓

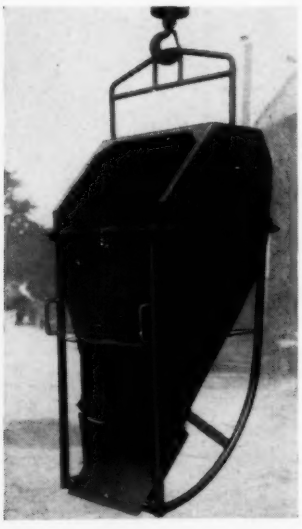
HOLLAND. *A fork lift truck supplied by Ransomes, Sims & Jefferies, Ltd., working in the stores of the Amstel Brewery, Amsterdam, Holland* ↓

REVIEW OF NEW EQUIPMENT

Spring suspension of its platform maintains constant working height of articles placed on the Autolevel trolley

HEAVY-DUTY ROLLOVER SKIP

A more robust version of their ½-cu. yd. Rollover-type concrete pouring skip has been introduced by Abelson & Co. (Engineers), Ltd., Coventry Road, Sheldon, Birmingham. Also of ½ cu. yd. capacity, this is designed to withstand far heavier usage than the standard lightweight type. The original non-choke front, solid forged bale bar and low charging height are retained, but a number of improved features have been added.



New robust version of the Rollover ½-cu. yd. skip

Two heavier T-section iron door-operating handles with a strengthening bridge gusset are fitted to the aperture shutter in place of the previous flat strap handle. The shutter is manufactured from ¼-in mild-steel plate to counteract the effects of buckling. This material is also used for the whole of the bottom section of the skip to withstand battering. Strengthening gusset plates have been fitted at the corners of the charging aperture, and a 3-in splash plate added to the bottom of the aperture eliminates spill when the skip is raised from the horizontal to the vertical. These alterations have increased the unladen weight to 588 lb but the price remains unchanged.

HYDRAULIC DRIVING WHEEL

Demonstrated at the recent Mechanical Handling exhibition by the makers, Hydrostatic Transmissions, Ltd., 33 Balfour Grove, London, N.20, a new hydraulic wheel is a simple but highly efficient means of driving pedestrian- and rider-controlled trucks of all descriptions. It is actually a slow-speed, high-torque hydraulic motor with stationary shaft and a rotating crankshaft which fits inside 12-in dia tyres. The standard model develops a drawbar pull of 500 lb when working at 4,000 p.s.i. The motor efficiency is stated to be 94 per cent, and the wheel provides ample power for a truck of 3 tons capacity. Simplicity is the main feature of this unit which provides any speed between 0 and 500 r.p.m. in either direction by operation of a single control lever. Braking is automatic, and smooth inching and creep speeds are readily obtainable. The prime mover can be a petrol or diesel engine or a battery- or mains-operated electric motor.

Hydraulic wheel for driving pedestrian- and rider-controlled trucks

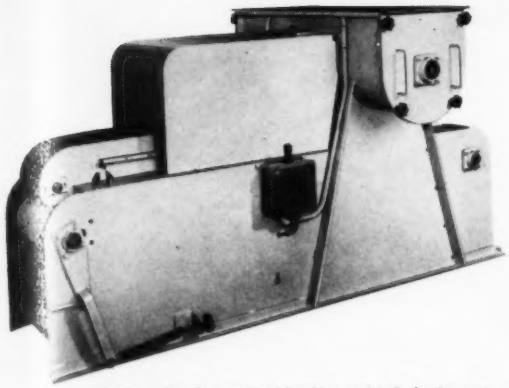
TROLLEY TO SAVE HANDLING EFFORT

Machine and process operators who handle large quantities of materials, parts or assemblies may expend considerable time and effort picking these up and putting work down at floor level. This can be largely avoided by the use of the new Autolevel trolley introduced by Barron & Shepherd, Ltd., 315 Kennington Road, London, S.E.11. The platform of the trolley is suspended from springs so that as each layer of articles is placed on it the level falls proportionately and similarly rises if removed, thus maintaining a constant working height for the operator. Besides the saving in time and effort, operators are enabled to keep up with the rate of speed of their machines. The size of platform is usually 32 in × 22 in with a travel of about 26 in, but these dimensions can be altered to suit requirements.

STIRRED BUNKER AND BELT FEEDER

Designed to store, weigh accurately and feed to processing machines at a predetermined rate materials normally difficult to handle and feed satisfactorily by conventional methods, a new stirred bunker and belt feeder unit has been developed by Wm. Gardner & Sons (Gloucester), Ltd., Bristol Road, Gloucester. It is based on a bunker fitted with an internal slow-running agitator of special construction, which keeps the material 'live' and prevents any tendency to bridge. A small volume of the material is delivered through an opening in the side and the same total volume is always present within a container at the side of the bunker. The density of the material available is thus not likely to vary due to variation in the amount in the main bunker.

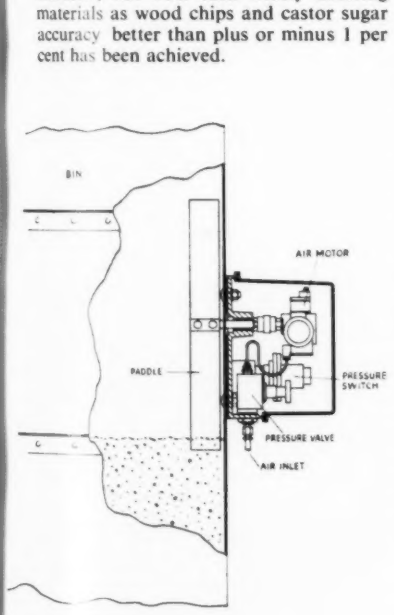
The associated feed mechanism consists of a belt which draws a layer of the material forward. With the normal stationary gate to control the level of the material on the belt there is a tendency for it to build up behind it, resulting in a very uneven flow. Instead, a rotating trimmer of special design ensures that the belt draws forward a level carpet of material, giving a volumetrically controlled constant output. The belt is often fitted with weighing mechanism which



The new Gardner stirred bunker and belt-feeder unit

Heavy load-shifting capacity is a feature of the new Allis-Chalmers model TL.16D Tracto-Loader

senses the weight of material on the belt at any time. By use of a feed-back system giving signals to a controlling device, the height of the trimmer, and thus the thickness of the carpet, is adjusted. The belt thus carries a compensated amount of material and delivers a regular weighed quantity per minute, even though the density of that presented in the original bunker varies throughout the run. The unit has been supplied with bunkers up to quite large holding capacities and the belt feeders have been arranged to give varying outputs, automatically controlled as required by process engineers. Possible accuracy depends upon the type of material, but with such widely differing materials as wood chips and castor sugar accuracy better than plus or minus 1 per cent has been achieved.



The Bindex level controller

PNEUMATIC BIN LEVEL CONTROLLER

To regulate and indicate the level of materials in bulk storage containers, the new Bindex pneumatic bin level controller is operated by compressed air, an important factor where electric circuits are undesirable, can be used for most types of solids or liquids, including cohesive materials, such as flour or cement, is inexpensive, simple to install and maintain and is thoroughly dependable. It consists of a casing, about 9 in square, which houses a pressure valve, pressure switch and air motor. Outside the casing is a simple paddle, normally 16 in long, connected to the air motor by a spindle which, in position, passes through the bin wall or roof, the casing being outside the bin and the paddle inside. The paddle oscillates under air pressure with a continuous see-saw motion, which is hampered or stopped when the level of the bin contents reaches the instrument. Interference with the paddle movements immediately activates the pressure switch which operates a light, sounds an alarm or initiates controlling action to the equipment feeding the bin. The pressure valve can be finely adjusted to give instant reaction, even on a stock which offers little resistance to the paddle movement.

In dusty atmospheres or where hazardous materials are stored, all electric parts can be positioned away from the site or, in some cases, be replaced by pneumatic equivalents. On multiple installations a common reducing valve is normally supplied to serve all the instruments and, if required, this and the pressure switches can also be positioned away from the bins. The Bindex can be fitted to most types of container, including concrete silos, and the paddle can be shaped to fit the inside wall. A 1½-in diameter hole is required through the bin wall or roof to take the spindle.

The makers, Henry Simon, Ltd., Stockport, offer a free testing service on customers' materials in their experimental laboratories.

NEW ALLIS-CHALMERS LOADER

A completely new Allis-Chalmers Tracto-Loader, the TL.16D, is now available in this country. This 4-wheel-driven machine has a complete power shift transmission with a 3·5 to 1 single-stage hydraulic torque converter, which multiplies the torque of the 104-h.p. diesel engine up to 350 per cent, and large planetary axles, which provide more rim pull with less strain on the axles, transmission, universal joints and differential. The axles are connected directly to the frame with 2-in steel pins instead of U-bolts, eliminating rolling and shifting under load and warping of mounting plates and bolts. The rear steering axle has an oscillation of 20 deg for negotiating rough terrain. Three speeds, whilst moving forward or reversing, with top speed of 27 m.p.h., are obtainable with a single lever by the Allison power shift transmission and hydraulic clutches. The TL.16D has power steering, 4-wheel brakes, applied with the right or left foot, and separate transmission parking brake.

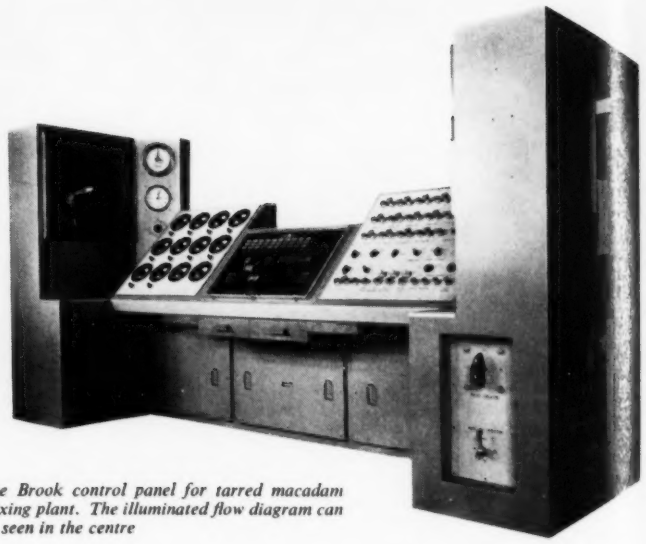
There is a range of buckets with capacities from 1½ cu. yd. to 4 cu. yd. based on a 7,000 lb carrying capacity and a lifting capacity of 17,000 lb. The hydraulic system ensures a break-out force of 20,500 lb at the cutting edge of the bucket, which has a 40-deg tip-back angle at ground level and 45 deg at the carrying position, maintaining full bucket loads while travelling. Air entering the system is double-filtered and oil is passed through full-flow micronic and magnetic and conical screen filters.

Dumping height is 9 ft from the cutting edge of a standard 2-cu. yd. bucket tipped at 45 deg with a 3-ft 0½-in reach, ideal for loading high-sided trucks and dumpers. With straight-line linkage of the main booms with the lift and dump cylinders maximum power is transmitted to the bucket. Both cylinders, with chromium-plated rods, are well away from the bucket, avoiding possible damage from dirt and rocks. Other features include a Hi-Traction differential, automatic clutch cut-off, giving full engine power to the hydraulic system at the touch of the brakes, a one-piece welded frame and a fully adjustable operator's seat. General dimensions are: Overall length with bucket at carrying position, 17 ft 6 in; overall width, 7 ft 6 in; ground clearance, 1 ft 3 in; tyres, front and rear, 14·00 × 24, 12-ply, tread, front and rear, 5 ft 10½ in; and shipping weight with 2-cu. yd. bucket, 18,000 lb. Optional equipment are special tyres, all-weather cab, heater and defroster, and special buckets, lift forks,

crane hooks, backfiller blade, bucket teeth and trench hoe are available.

Sole United Kingdom concessionaires are Mackay Industrial Equipment, Ltd., Central Way, Feltham, Middlesex.

The new Udal roller-topped 1-ton lifting table



The Brook control panel for tarred macadam mixing plant. The illuminated flow diagram can be seen in the centre

1-TON LIFTING TABLE

For use in heavy press shops, the new Udal tool-loading table is intended to eliminate damage to crane slings and press equipment, while providing greater safety for setters during tool changing. It has many other applications in industry where heavy items of equipment need to be lifted, but floor conditions preclude the use of stackers. A 36 × 24-in roller table top, with double-track rollers, facilitates loading and removal, while a reversible stop prevents accidental running-off. The model illustrated has fixed feet and will lift up to 1 ton by means of a manual ratchet lever. Motorized adjustment and castors are available as extras, and special sizes can be built to individual requirements by the makers, J. P. Udal, Ltd., Interlock Works, Court Road, Birmingham, 12.

TARRED MACADAM PLANT CONTROL PANEL

A new panel to control the mixing of tarred macadam has been introduced by Brook Motors, Ltd., Empress Works, Huddersfield. The basic materials used in an automatic mixing plant are ten different grades of stone, ranging from dust to 1½ in, filler, flux, three grades of binder and water. Complete flexibility was essential and all controls were required to be at a central point. By means of selector switches, process timers, weighing dials, flowmeters and batch counter any specification and total weight can be pre-set on the panel before operation is started. Pressing of one push-button will automatically deliver and mix the desired quantity in 2-ton batches.

From the storage hoppers the material is passed on to a conveyor in controlled quantities. If required in its raw state, it can be delivered directly to rail or road wagons. Tarred macadam is re-routed along a conveyor system to the mixer house where it is first check-weighed. In case of under- or over-weight, within certain limits, the plant is automatically stopped or the operator is warned so that this particular batch can be adjusted to keep the final material consistent. The material is then passed to a rotary pre-heater to heat the stone before binder is added in the mixer, otherwise the hot binder would quickly stiffen on the cold stone. In the mixer any of the pre-set quantities of binder, filler, flux or water are added in a variety of sequences and time, depending on how the controls were set. The material is then dropped into a wagon beneath the mixer or into a storage hopper. As one part of the process is completed and is passed to the next, a further 2-ton batch is delivered to the idle section, so that material passes continually through the plant without delay until the quantity is complete. The whole process is indicated on an illuminated and coloured flow diagram on the panel. All equipment for the mixing plant is housed in a console-type cabinet in a control room with windows overlooking the mixer house, allowing the operator complete freedom of surveillance while the automatic sequence is in operation. The new panel works in conjunction with one previously installed for drawing accurate quantities of dry stone from the storage hoppers. Both now work in conjunction with each other, a signalling system keeping the operator informed of the state of both plants.

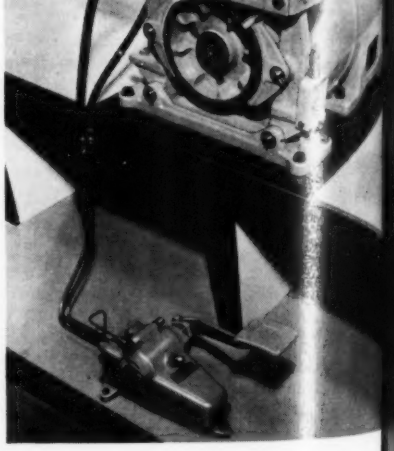
OVERHEAD CRANE HYDRAULIC BRAKE

A new hydraulic Perigrip brake, introduced by the Motor and Control Gear Division of Associated Electrical Industries, Ltd., Rugby, is available in 8-in, 10-in and 12-in drum sizes with braking torques up to 400 lb/ft, and is specially suitable for long travel motions on overhead cranes. Many parts are interchangeable with those used on the company's range of electrically operated brakes, but, in place of the usual electromagnetic device on the operating arm, the new brake has a simple hydraulic receiving unit. This is actuated by oil pressure delivered by a foot-operated transmitter unit to which the driver's brake pedal is attached. The hydraulic fitments are manufactured by Exactor, Ltd.

The brake shoes are normally off, and by movement of the pedal the braking torque can be applied and increased smoothly up to the maximum permitted by the brake mechanism. The advantage of this over the positive snap action of an

(*Continued on page* 631)

A Perigrip hydraulic brake fitted to an AEI-Type KN-C electric motor



A Vigzol mobile lubrication depot for servicing contractors' plant on site

A Hyster model D tamping roller fitted with the new third wheel attachment to increase the compaction width

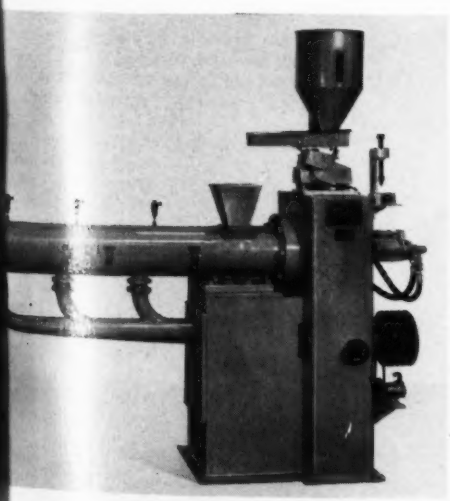
electric brake when applied to the travel motor of an electric crane is that it minimizes any tendency for the load to swing when the crane is stopped suddenly.

MOBILE LUBRICATION FOR CONTRACTORS' PLANT

Portable equipment for *in situ* lubrication of earthmoving plant is announced by Vigzol Oil Co., Ltd., Vigzol House, Greenwich, London, S.E.10. Following a successful try-out on the M.1 by a sub-contractor, Martin Cowley, Ltd., have called for two units to service their earth-moving plant during the construction of the Stevenage by-pass and expect a saving of up to 12 hours per week for each machine serviced by the elimination of time-wasting traffic of the plant between the work-face and a servicing depot. Plant will be serviced during 'break' periods with no loss of working time, a vital consideration with machines geared to work on a round-the-clock basis when an oil drain is often required every 2½ days. This trailer-mounted depot carries 3 tons, 750 gallons, of oil, enough to service ten machines. Five different grades of oil are supplied, including gear, engine and hydraulic oils, as well as grease. Basic equipment on each unit, which can be drawn by tractor or Land Rover, comprises tanks, pumps, hoses and containers for retaining drawn-off sump oil. Manned by a lubrication engineer and a fitter, these mobile depots are supplied as a Vigzol service. On the Stevenage by-pass each unit will be replenished twice a week and oil will be delivered in bulk direct to the site from the Manhattan Wharf.

THIRD WHEEL TO INCREASE COMPACTION WIDTH

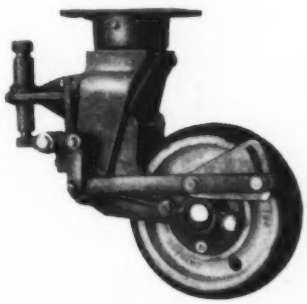
The compaction width of the Hyster Model D tamping and grid rollers can be increased from 6 ft to 10 ft by a third wheel attachment announced by the Tractor Division of the Hyster Co., 2902 N.E. Clackamas Street, Portland 8, Oregon, U.S.A. The standard rollers consist of two wheels, each 32 in wide, mounted inside a frame. The attachment contains another wheel in a separate frame which can be hinged to the side of the basic unit, providing flexibility on uneven ground. The roller tongue is relocated on a special bracket, placing it on the centre of the frame for towing. By removing the hinge pins and re-bolting the tongue in its original position, a roller can be quickly converted back to its original width. Both rollers are designed for high-speed compaction. The tamping roller excels in plastic soil, while the open-surface grid roller is designed for granular soil compaction and rock crushing.



A Burtonwood-Andouart 90-mm L/D resistance-heated thermoplastic extruder

BRAKED AND STEERED CASTOR

A novel form of castor and mounting is that recently produced by Autoset (Production), Ltd., Stour Street, Birmingham, 18. The assembly consists of a horizontal flanged semi-elliptic spring and braked wheel castor with Ackerman steering control connection. The castor has an equalizing floating load of 400 lb, and the vertical pin, which is used for the transverse Ackerman bar connection to an adjacent castor, can be depressed vertically to apply an expanding brake in the wheel. There is no need to lock the swivel unit as the castor is always used in pairs or fours. Malleable castings are used throughout for the 8-in dia wheel castor, and aluminium alloy castings for the 10-in and 16-in dia models.



The Autoset castor assembly with horizontal mounting flange, semi-elliptic spring, braked wheel and steering control connection

BURTONWOOD ENGINEERING EXPANSION

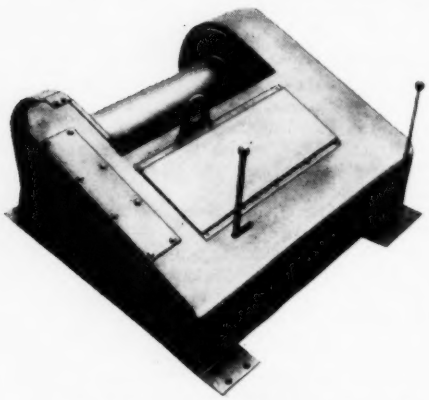
A new plastics machinery bay, measuring some 168 × 60 ft, was recently opened by Philip A. Roth, a director of U.S. Industries, the American industrial concern, at the factory of the Burtonwood Engineering Co., Ltd., Lancs. It will be used for the manufacture of plastics machinery and has been specially designed to give extra overhead clearance so that travelling cranes may handle heavy machinery with ease. Though the bay has only recently started production, another new extension is already being built to meet the demand for plastics machines.

They are supplied to leading cable manufacturers in the United Kingdom, and there are plans to sell in North and South America and Russia.

One of the latest machines designed at Burtonwood is a fully automatic tube and profile cut-off saw. It can be left unattended for long periods and, when once set, needs little attention. Recently the largest extruder ever made in the factory was delivered to a cable manufacturer in the south. This is a 150-mm 15 : 1 LD ratio induction-heated thermoplastic extruder having a throughput capacity of 560 lb/hr at 50 r.p.m. It weighs 6½ tons without its 100-h.p. electric motor and variable speed gear.

NEW ELECTRIC WINCH

A new range of electric-powered winches, available in capacities from 2 to 12 tons, has recently been announced by Felco Hoists, Ltd., 29 Cromwell Road, South Kensington, S.W. A 3-ton model was



One of the new range of Felco electric winches available in capacities from 2 to 12 tons

exhibited at the recent Mechanical Handling Exhibition. They are of entirely new design, having no bedplate or platform. All parts of the mechanism are fully enclosed, the absence of exposed parts making the equipment weatherproof. All the gears run in oil baths and are mounted on ball bearings. Features include an electro-hydraulic main brake in addition to an auxiliary foot brake for controlling the load when operating the winch in the drum idling position.

MUIR-HILL LOADER WITH POWER DIGGER

To meet a growing demand for a heavy-duty loader equipped with a power digger capable of a high output, E. Boydell & Co., Ltd., Old Trafford, Manchester, have announced that the Muir-Hill 2WL Mark II loader, introduced last year, is now available fitted with the American Sherman hydraulic power digger, or trencher, manufactured under licence by Bray Construction, Ltd. The digger can be quickly and simply detached so that the loader may be operated as a conventional shovel. It is stated that it accounts for 85 per cent of all power diggers in the United States and that it excavates faster than any other trencher.

A hydraulic pump in the digger unit is driven by an integral hydraulic motor that takes its power supply, through a pair of flexible hoses with self-sealing couplings, from the loader hydraulic system. A 4-pin attachment enables the digger to step off the loader under its own power within a few minutes and to step back into position quickly while connected to the loader only through the flexible hoses. Detachable ballast boxes for use when the loader is engaged in conventional duties are available as extras. The ballast box can be supplied with lifting tackle and adjustable legs so that it can be carried from site to site in the loader bucket.

LIGHT-WEIGHT ELECTRIC CHAIN HOIST

The Goliath electric chain hoist, Series I, has been designed to combine high efficiency and light weight with minimum headroom at a competitive price. The main body shell is of light alloy of high tensile strength and ductility with exceptional resistance to shock and corrosion. Modern precision worm gearing ensures

A Muir-Hill 2WL Mark II loader equipped with a Sherman hydraulic power digger

Hook suspension type of Goliath 2-ton electric chain hoist

silent, vibration-free running, long life dependability and minimum maintenance, all gears being immersed in an enclosed oil bath. All parts are inter-changeable. To be extended in the near future, the present standard range of hook suspension models comprises 10-cwt and 1-ton units lifting on a single fall of chain and a 2-ton unit lifting on two falls. These weigh 118, 120 and 138 lb, have lifting speeds of 40, 20 and 10 f.p.m., and headrooms of 16½, 17 and 24 in respectively.

The ⅜-in dia load chain is of high tensile steel to BSS.1663, and drop-forged steel hooks are fitted throughout with enclosed thrust races. Other features are phosphor-bronze worm wheel, heat-treated steel worm and bevel gear, totally-enclosed electric hoisting motor, electro-magnetic caliper-type brake and push-button control. All models can be supplied with Goliath Quikfit trolleys of the hand-pushed, hand-geared or electric power-travel types or with fixed suspension.

Manufacturers are Lifting Gear Products Eng., Ltd., 244 Earsham Street, Sheffield, 4.

TRADE NOTES

Fédération Européenne de la Manutention Shortly to be published by the Fédération Européenne de la Manutention, is an Illustrated Terminology of Mobile Cranes. Translated into six languages, the terminology includes an alphabetical index, a list of terminologies, and a section on the origin and objectives of the Fédération.

Agents in Australia for Hamilton William O. Bullock announce, on behalf of W. R. Hamilton (Plymouth), Ltd., Tavistock, Devonshire, that R. F. Jeffries Pty., Ltd., Hotham Parade, Artarmon, New South Wales, have been appointed sole agents for the Hamilton Vibratory Hopper Unit and its Electronic Orientation Attachment for Australia and New Zealand. The first consignment of these units was shipped to Australia early in May. The Electronic Orientation Attachment, a new development of the Hamilton Vibratory Hopper, provides a method so that hitherto awkward components may be very simply sorted in either direction and

(*continued on page 633*)

enables users to develop and orientate the hopper unit in their own works.

Bowmaker, Ltd.

Bowmaker, Ltd., of Bournemouth, announce that new offices at Mansfield have been opened at 28 Leeming Street, Mansfield. Tel. No.: Mansfield 6428. The resident representative will be R. M. Plant. G. Snelgrove has been appointed resident representative at the Coventry office at Broadgate House, Broadgate, Coventry. Tel. No.: Coventry 61336. At Hull office, Middleton Chambers, Lowgate, the telephone number 16753 has been changed to 28753. The other number, Hull 35990, remains unaltered.

Mercantile Credit Co., Ltd.

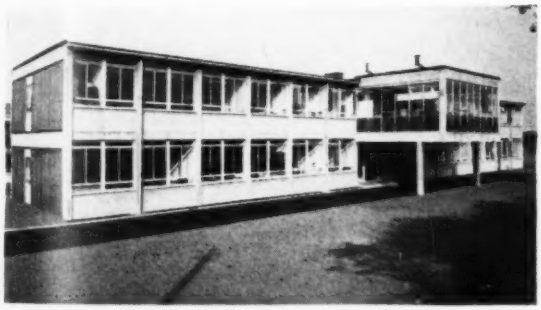
The above announce the formation of a new company, Mercantile Leasing Co., Ltd., to engage solely in machinery and equipment leasing. Rapid technological improvements continuously demonstrate to management the need for replacing existing machinery, equipment and vehicles. To keep up with such improvements is essential, but it can absorb working capital. Therefore this company anticipates that this new plan will be welcomed by managements who see the need for new machinery, equipment, fleets of cars and vehicles, etc.

New-style Fork Lift Trucks for Grant's

William Grant & Sons, Ltd., proprietors of 'Stand Fast' Scotch whisky, have bought two specially built battery electric fork lift trucks from the Yale & Towne Manufacturing Co. for use in stacking whisky barrels. One is already in use at one of Grant's distilleries at Dufftown. The other will be used at the company's new bottling plant at Paisley.

This new type of truck, of 5,000 lb capacity, has been specially designed to solve the problem of handling barrels. Although it can lift half a ton to a height of 20 ft, its overall height is only 8 ft 6 in,

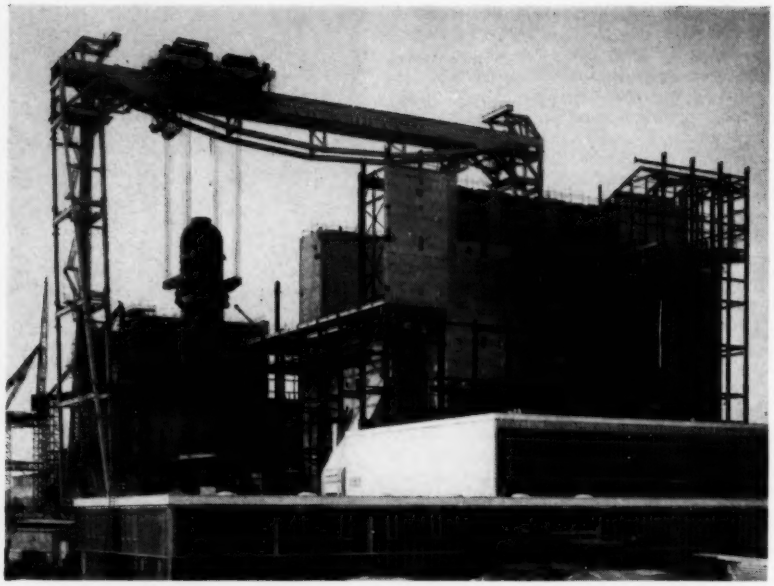
BELOW:
This building forms part of the Central Research and Development Laboratories of The Chloride Electrical Storage Co., Ltd., at Clifton, near Manchester. From these Central Laboratories technical information about the newest developments in manufacturing processes and in all manner of battery applications flows to the Group factories in the United Kingdom, and in almost every country of the British Commonwealth. The laboratories also fulfil a vital function in helping to establish factories in several of the younger countries where industrial development has not reached such an advanced stage as that of Western Europe



ABOVE:
The 50-ton wagon tippler illustrated here is a large side-discharge model erected before shipment in the Erith Engineering Works of The General Electric Co., Ltd. It has been installed as part of a development programme at the West Hartlepool works of South Durham Steel & Iron Co., Ltd. Its purpose will be to unload coal for the coke-oven plant at the rate of 30 wagons per hour, at the same time weighing and recording the tonnage handled. The order for the tippler was placed with G.E.C. by Birtley Engineering, Ltd., sub-contractors to Gibbons Brothers, Ltd., for the coal-conveying section of the coke-oven plant

LEFT, BELOW:
This Taylor Jumbo crane fitted with a grabbing attachment is one of two operated by the Direct Coal & Lime Co., Ltd., of Albion Street, Leeds, for transferring coal from railway trucks to large hoppers at the Foss Islands depot at York. Powered by Perkins P4(I) industrial diesel engines, capable of producing 50 b.h.p. at 2,000 r.p.m., and for this application rated at 40 b.h.p. at 1,800 r.p.m., the cranes lift approximately 1 ton of coal at each operation

BELOW:
Members of a distributors' meeting held by Tunny Cranes, Ltd., at the works of Clayton Goodfellow & Co., Ltd., Blackburn, Lancs., who manufacture the crane for Tunny Cranes, Ltd. Attending the meeting were managing directors and senior executives of Tunny distributors, all of whom are already established in the field of industrial and building equipment. After the meeting the visitors were conducted around the works where they were able to see crane production in progress



This picture shows the third 90-ft high steam-raising unit approaching the side of No. 1 reactor at Hinkley Point atomic power station, where it will be finally positioned. Hinkley Point, the world's first 500-mW atomic power station, is being built for the Central Electricity Generating Board by the English Electric—Babcock & Wilcox—Taylor Woodrow Atomic Power Group

which enables it to pass through low doorways. The truck is fitted with a triple-lift mast, and has a hydraulically operated stabilizer which holds the barrels on a steel platform. When this is raised, the barrels roll sideways into the racks. Because of this sideways operation, the truck does not have to turn in the aisles. These can thus be as little as 6 ft wide, thereby increasing the amount of storage space available.

Crofts Open New Distribution Centre

Over the past 25 years Crofts (Engineers), Ltd., have maintained a branch sales office, with resident technical representatives, at Daimler House, Paradise Street, Birmingham. It has now been decided, in view of increasing demand and the importance of the area, to provide on the spot stocks and delivery service from new premises at 253-255 Great Lister Street.

Dexion Opens New Factory

Thirteen years after production of Dexion slotted angle first started in a tiny Chingford building, the new factory standing on an 8-acre site at Hemel Hempstead was officially opened in June by Mr. J. Allason, M.P. for Hemel Hempstead.

Production which had previously been spread over three factories is now concentrated at Hemel Hempstead. The factory produces slotted angle, open steel plank, shelves and accessories for home and overseas. Also housed at Hemel Hempstead are the Group's Plastics and Timber Divisions which produce Undulite, glass-fibre reinforced plastic sheeting, and Tecton, engineered wood beams.

Order for Dewhurst

Dewhurst & Partner, Ltd., announce that they have received instructions from Richard Thomas and Baldwins, Ltd., for the supply of individual motor starters and contactor pattern lighting control panels for the Spencer Works at Newport. The individual motor starters cover ranges up to 90 h.p. of direct-on-line pattern of heavy-duty steel works construction and incorporating frame mounting Type H. contactors and Type E.T. thermal overloads with inherent single-phasing protection.

Crane Controls Ordered

Brookhirst Igranic, a company in the Metal Industries Group, is to supply crane controls valued at £120,000 to the new Spencer works of Richard Thomas & Baldwins at Llanwern, near Newport. This brings to more than £400,000 the value of crane controls ordered from Brookhirst Igranic since the beginning of this year. The equipment for Richard Thomas & Baldwins will be for use with cranes supplied by Joseph Adamson and the Wellman Smith Owen Engineering Corporation.

Niagara Change their Title

Niagara Screens (Great Britain), Ltd., announce that due to a widening of their manufactures, their title is to be changed to Niagara Screens & Plant, Ltd. Their address remains the same, with a much enlarged works.

Packaged Homes Carried to Site by 'Straddle Truck' Carriers

By using Hyster Straddle Truck carriers to transport building supplies direct to house sites, Phoenix Development Co. of Omaha, Nebraska, saved 43 per cent in handling costs, compared with previous handling methods.

Two Hyster Straddle Truck carriers transported all building supplies from a rail siding over a mile away to an assembly

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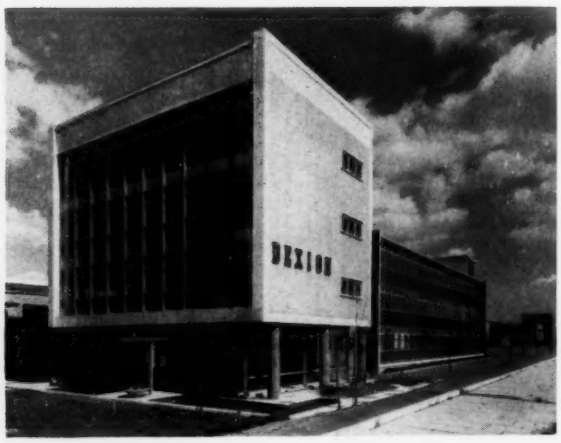
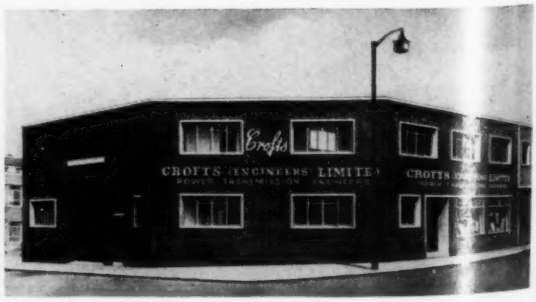


A front view of the administration block of Dexion's new Hemel Hempstead factory

Crofts (Engineers), Ltd.'s new distribution centre



Although 12 years old, this mobile crane is still used by N.V. Machinefabriek "Bolnes" v/h J. H. v Cappelen, Krimpen a/d Lek, Holland, to lift loads of more than 5 tons. Originally fitted with a petrol engine, the crane has been operated by a Perkins P4(1) industrial diesel engine for nearly two years. During this time the 4-cylinder Peterborough-made diesel engine, developing up to 55 b.h.p. at 2,400 r.p.m., has run for 4,000 trouble-free hours

RIGHT:
This picture, taken in a Derbyshire quarry, shows one of the 15 tracked tower drill rigs ordered by Russia undergoing field trials, watched by engineers of the U.S.S.R. Trade Delegation in Britain

area, where all lumber was cut to size. Complete packages were placed on bolsters and, together with all necessary component materials, were transported to the actual site by straddle truck.

British Drilling Machines of Revolutionary Design for Russia

Engineers of the U.S.S.R. Trade Delegation in Great Britain recently witnessed field trials at a Derbyshire quarry of a drilling machine of revolutionary design. The first of 15 similar tracked tower drill rigs destined for Russia, it is part of an order already announced, worth over £250,000, won by the Holman Group subsidiary, Climax Rock Drill & Engineering, Ltd., in conjunction with F. Taylor & Sons (Manchester), Ltd. This mobile machine has four drifters (Holman medium-weight S.L.280 drills mounted on power-feed cradles) that can be operated simultaneously by two operators and are capable of drilling a rock face from ground level up to 32 ft high and with a horizontal span of 24 ft. The booms and collapsible tower are hydraulically operated and are remote controlled from panels on the platform above the tower. The tower is mounted on electrically driven tracks which can negotiate rough and uneven ground and a gradient of 1 in 7 was successfully tackled at the recent tests. Electric motors of 40 h.p. and 7½ h.p. are provided for track drive and hydraulic pump drive, respectively, and a compressed air supply of approximately 700 c.f.m. is required.

The National Coal Board's Parker mobile screening plant

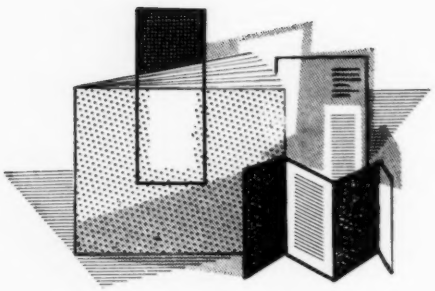
National Coal Board uses Parker Mobile Screening Plant

A mobile screening plant, made by Frederick Parker, Ltd., of Leicester, and built specially for the National Coal Board, is being used at an East Midlands colliery to re-screen good-quality Hazel doubles coal from stockpiles.

The plant, which is mounted on pneumatic, rubber-tyred wheels, consists of a 4-cu. yd. capacity hopper, mounted above a 48-in × 96-in single-deck 'Rapide' 2-bearing, free-floating-type vibratory screen, and two conveyors for loading direct into lorries or stockpiling. The plant is driven by a 10-h.p. Petter A.V.2 diesel engine and has dual air pressure brakes on rear wheels.

Change of Address

Precision Components (Barnet), Ltd., announce that their new address will be Kabi Works, Cranborne Road, Potters Bar, Middlesex. Tel. No.: Potters Bar 3444.



ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

AVOIDING CONVEYOR ACCIDENTS

Selection and Use of Conveyor Safety Devices. By Jervis C. Webb. *Material Handling Engineering*, 812 Huron Road, Cleveland 15, Ohio, U.S.A. March, 1960. Pp. 60-62 and 98. 75c.

Quoting the Conveyor Equipment Manufacturers Association, the author states that conveyors are more widely used through industry than any other type of heavy machinery. Yet less than 1 per cent of all accident compensation cases involve conveyor equipment. Conveyors, by their nature, tend to prevent accidents, but manufacturers are building safety devices to make them even more fool-proof.

After giving some of the main reasons why the use of conveyors avoids accidents, the author refers to a safety code called the American Standard Safety Code for Conveyors, Cableway and Related Equipment, and some of the do's and don't's in the interests of safety. Illustrations are given of some of the devices which have been introduced to prevent accidents with conveyors of different types.

NON-CONTACTING CONVEYOR

Porous Metal Provides Float-on-Air Conveyor. *Metalworking Production*, 95 Farringdon Street, London, E.C.4. May 11th, 1960. P. 863. 1s. 6d.

A novel method of handling materials of high surface sensitivity has, it is stated, been developed by the Corning Glass Works. It is based upon the properties of a material named Cormet A, which is a pressed and sintered nickel of controlled porosity, produced by a new process that renders practicable the manufacture of larger unit parts than is possible by conventional powder metallurgy techniques. Air flow through a sheet of Cormet A ¼ in thick, at a pressure of 15 lb/sq. in., is about 5½ cu. ft./min. If, therefore, a chute formed of this material is backed by a metal duct of impervious sheet containing air under pressure the air escapes via the pores to the outside surface of the material. A cushion of air is thus formed and the material being transferred slides on this, never touching the actual surface. This type of conveyor can also be used for handling heated material, such as molten glass.

LIFTING ON AIR

Overhead Travelling Crane with Pneumatic Tyres. *Engineering*, 36 Bedford Street, London, W.C.2. May 13th, 1960. P. 671. 2s.

In a short illustrated article details are given of a recent overhead travelling crane modification at the Aylesford, Kent, mills of the Reed Paper Group, developed by W. S. Atkins and Partners, consulting engineers, 158 Victoria Street, London, S.W.1, in collaboration with Strachan & Henshaw, Ltd., St. Philips, Bristol 2. This is the fitting of commercial-vehicle-type pneumatic-tyred wheels to a pair of 3-ton overhead cranes in place of the conventional steel-flanged wheels running on rails. This change-over, it is said, was made to overcome the troubles arising from 'cross-binding', frequently encountered with cranes of this type, in this case accentuated by intensive three-shift operation with long travel and high speed.

The cranes, with new end carriages, now run on two smooth concrete runways about 12 in wide. Each end carriage, which has five wheels, is guided by 31-in solid-rubber-tyred wheels which bear on the sides of the runways to keep the crane travelling in a straight path. All wheels have roller bearings, and the traversing drive is taken from two 7½-h.p. Crompton Parkinson electric motors to one carrying wheel on each end carriage through a Crofts reduction gearbox. It is claimed that new rubber-tyred cranes or conversions are feasible up to 30 tons lifting capacity, using standard commercial vehicle tyres.

TUBULAR CONVEYANCE

Handling Machining Wastes. *Automation*, Penton Building, Cleveland 13, Ohio, U.S.A. April 1960. Pp. 94-96.

This article first points out that increasing production rates of machine tools and other manufacturing equipment may force up the speed of related functions of which the removal of by-products, such as chips, dusts and sludges, is an example. Continual removal systems are either unitized or centralized. In the former case each machine has its own collecting and disposal arrangements, while in a centralized system waste products are delivered to a common collection point by feeder lines from each machine. The choice depends upon the waste-producing capacity of each machine and the layout of the factory.

Reference is made to the manufacturing area of the International Harvester Co. where both systems are used. The conveyors installed are of tubular type manufactured by Hapman Conveyors Inc. Each includes a system of piping, shaped to suit the application, through which an endless chain circulates continuously. Selective openings in the piping permit the introduction of chips and scrap, while others permit dumping. Attached at regular intervals to the circulating chain are flights, or discs, that engage and move the materials through the piping.

Another chip conveyor described handles a wet mixture of chips and coolant. In order to reclaim the coolant for re-use, the initial section of conveyor pipe is nearly vertical so that the coolant drains into an underfloor sump to be pumped back to the machine, and relatively dry chips proceed to a tote bin.

FOR HANDLING METAL COILS

Coil Lifting, Tilting Mechanism. *Metal Products Manufacturing*, York Street at Park Avenue, Elmhurst, Illinois, U.S.A. April, 1960. P. 77.

A combined coil lifting and tilting mechanism for use in metal mills and warehouses developed by the American Forge & Manufacturing Co. is, it is said, designed to handle coils ranging from 5,000 lb to 30,000 lb in weight. It can be operated either from the crane cab or from pendant controls and can lift and tilt from the vertical to the horizontal or vice versa in about 45 sec. The holding mechanism, operated by an electric motor through reduction gear, applies an initial grip through one wall thickness of the coil which is held by self-gripping shoes to eliminate any chance of it being dropped while being moved. When the coil is

(*Continued on page* 637)

lifted, the turning mechanism is put into operation. It is actuated through a worm gear screw jack, also powered by an electric motor. Because of the reduced number of handlings with this device, it is said that it saves considerable handling time with less chance of coil damage.

AUTOMATIC GRAB OPERATION
Spring-loaded Parallelogram Simplifies Grab-bucket Control. By Celestino O. Lubatti. *Design News*, 3375 S Bannock, Englewood, Colorado, U.S.A. April 11th, 1960. P. 72.

Brief particulars are given of a new Italian jib crane developed by Zambon Macchine-Edili, Rome, Italy. An articulated parallelogram carrying the pronged claws of the grab is stretched by a coil spring which eliminates rope control for opening and closing it, which are done by impact force acting in alternate directions against the lower pin joint of the parallelogram. Four vertical guide rods connecting the lower pin joint with the lift rope anchor clamp allow the upper pin joint to slide vertically but prevent it from turning sideways. Double tackle on the jib includes a movable pulley turning on the upper pin joint. Rope relaxation with the grab fully open causes impact of the lower pin joint against the material to be hoisted. Upward force folds inward the parallelogram and the pronged claws to take up the material. At the end of the lifting stroke the anchor clamp impinges against the jib and the resulting downward force expands the grab and releases the material.

LIFTING BY COMPRESSED AIR
Pneumatic Hoist Block. *Engineering Materials and Design*, Drury House, Russell Street, London, W.C.2. June, 1960. P. 365. 2s. 6d.

The Soviet turbine engineering works in Riga has, it is stated, started the production of a range of new type pneumatic blocks of different lifting capacities. The moving element consists of two horizontally opposed pistons and cylinders which are linked by a steel wire rope wound around a multi-sheave pulley block. The cylinders are attached to the flanges which are joined by tie-rods with distance pieces. Near the centre there is an intermediate ring with the guide pulley below it and the trolley above. The pistons are attached to rods whose opposed fork ends carry the multi-pulley blocks. According to the size and type, the blocks consist of three to six pairs of pulleys mounted on the axles on assembled rollers, which constitute rolling friction bearings without cages, for each individual pulley since the angular speed of adjacent pulleys is different. The steel wire rope is taken over the pulleys, one end being attached to the intermediate ring by means of a wedge. As compressed air enters the working sides of the cylinders between the flanges and the pistons, the latter move in opposite directions and in turn extend the block. Displacement of the cylinders is transmitted to the lifting hook.

OUTSIZE DOZER BLADE
Coal Blade Lets Tractor Handle Bigger Loads. *Power Engineering*, 308 E James Street, Barrington, Illinois, U.S.A. April, 1960. P. 104.

An optional accessory for the American Model C Tournatractor, which is capable of speeds up to 17 m.p.h., is said to be a coal blade that can handle about 50 per cent more material than a conventional dozer blade. It measures 15 ft wide and 4½ ft high. The added size and curvature of the blade causes the coal to keep a live rolling action ahead of the machine reducing normal resistance encountered in coal handling. The manufacturers state that in a straight-line comparison it can push between 6 and 12 tons as compared with 4 to 7 tons with a conventional dozer blade over the same distance.

LIFTING HOT OR COLD STEEL COILS
Coil Handling Magnet. *Iron and Steel Engineer*, 1010 Empire Building, Pittsburg 22, Pennsylvania, U.S.A. April, 1960. Pp. 260 and 264. $1.50.

A multi-pole coil-handling magnet described has been specially designed, for use in mills, fabricating plants and warehouses, by the Ohio Manufacturing Co. It is recommended for handling hot or cold strip coiled sheet steel. The maximum operating temperature is approximately 1,000 deg F. It is offered in sizes ranging from 23×46 in with lifting capacity of about 11,000 lb up to 62×62 in with 70,000 lb lifting capacity, for tightly wound coils under average conditions.

The magnet poles are located over the coil edges, thus providing an efficient flux path for maximum lifting power with minimum stray field so as to prevent attraction of small parts to the bottom of the coil. Elongated pole shoes distribute the coil weight over a large area, further minimizing damage to the coil edges. The magnets are of two- or four-pole construction, depending on size. Each pole is a separate magnet, having its own coil, cast non-magnetic housing and extended pole shoe. Adjacent poles are of opposite polarity.

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RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

HOOK BLOCK
National Supply Co., of Pittsburgh—U.K. 822246.

Derrick hook block for well drilling, somewhat as per patent 740750, with an improved gimbal, to allow slight cant in the block without tilting the spring hook.

SHIP'S DERRICK
A. E. Hallen, of Gothenburg—U.K. 822610.

For rapid ship's cargo handling with two topping lifts at an angle.

CHUTE VIBRATOR
Gebruder Buhler, of Switzerland—U.K. 822664.

For grain handling, riddling, etc., with one chute suspended by hangers, the other by sliding shoes.

POWDER BLOWER
Cooper McDougall & Robertson, Ltd., of Berkhamsted—U.K. 822733.

Shader lid container which avoids air expulsion, using an air nozzle lined up with exit channel in the powder mass.

CONVEYOR CONTROL
British Thomson Houston Co., Ltd., Aldwych—U.K. 822743.

A conveyor feed control by means of variable motor voltage.

HOPPER FEED
Societa G.D., of Bologna—U.K. 822765.

Feed for acramels, by rotary disc leading to openings, operated by gravity, aided by centrifugal force, using a conical-shaped feed entrance.

CONVEYOR TRAYS
Abbco Bread Co. Pty., Ltd., nr. Sydney—U.K. 822786.

A simple form of bread baking oven tin, using a cover which is automatically shut or opened by a pivot operated at the appropriate position.

WEB HANDLING
Keelavite Co., Ltd., of Coventry—U.K. 822803.

A system of winder control for flexible webs or strip, with a response device noting changes in the speed ratio of the rotary members and controlling it, e.g. the tension by means of hydraulic valves.

WRAPPING
Industrial Machinery Co., Ltd.—U.K. 822822.

Packaging machine using chain-driven hollow mandrels, giving guided movement, for handling packets of cigarettes, e.g. for wrapping.

WEB HANDLING
Zimmers Erben K.G., of Austria—U.K. 822833.

Roller handling support for paper, giving equal distribution of printing or coating fluids, with simpler forms of roller avoiding journal bearings at the ends having no axles. Bending is prevented by partly embracing the rollers in bearing boxes along their length.

SCRAPER
G. Piemont of France—U.K. 822870

A conveyor design with folding scraper plate at the front, using a rotating disc to feed rearwards at ground level.

BOTTLE WASHING
H. E. Bairier, of Grenoble—U.K. 822923

Rotary holder with spider element and conveyor blades, to feed bottles through washer via channel guides, using a spiral set-up.

CONVEYOR
Geo. W. King, Ltd., of Stevenage—U.K. 822927.

A dual-duty conveyor design with trolleys supported on a fixed track, propelled by pusher dogs or chains—with step motion continuing along any 'sidings'.

TRUCK TIPPLER
W. H. Barker & Son Engineers, of Stoke—U.K. 822941.

Mine car or rail truck tippler for underground use, which is compact and uses two pivoted frames inside each other, one turning by gravity.

SUPPORTING CARRIERS
Joseph Lucas, Ltd., of Birmingham—U.K. 822943.

Chain or belt drive supporting carriers, with intermittent action, and disengagement of carrier automatically if stalling or delay occurs, using ramps and projections.

METAL HANDLING
Leeds & Northrup—U.K. 822944.

Transfer machine for handling heavy loads for heat treatment under atmospheres, e.g. normalizing, using external drive.

STAIRWAY
Westinghouse Electric International, of New York —U.K. 822959.

Improved roller or wheel supported stairway with the first wheel covered with more yieldable rubber than the second.

LORRY TIPPER
Daimler Benz A.G., of Stuttgart—U.K. 823023.

Tipper lorry so arranged that the cab is pivoted also, on the main tipping body.

MINE HOIST
Anglo American Corporation of South Africa, Ltd., Johannesburgh—U.K. 823035/6.

Design of winding drum with circumferential walled compartments with several ropes attached to handle a load, including a monitor for the rope layering. Also present is a disaster avoider if a rope breaks, using a tension balanced brake if the break happens.

WHEELED TRAILER
A. C. Le Riviere, of London—U.K. 823069.

Two-wheeled boat or dinghy road trailer, able to deal with a range of sizes, using an adjustable pivoted central frame.

ROCK CRUSHER
Markham & Co., Ltd., of Chesterfield—U.K. 823121/2/3/4.

Machine using shear process so that it need be only fifth as strong as usual rock crusher. Uses a set of rotors with a grid of bars beneath which narrow towards the bottom, so holding large ore to be sheared by rotor, which may oscillate if desired.

FISH DRESSING
Fisadco, Ltd., of London—U.K. 823143/4.

A fish dressing machine holding them on rotary table so that a convex cutter can remove the head. The tail is then clamped properly during later actions with an arrangement that path movement time before clamping depends on the fish thickness.

CRATE STACKING
B. G. Tolley, of Australia—U.K. 823148.

Bottle crate unstacker for dairy use, which lifts the whole stack except bottom crate, as this latter moves away on a conveyor using a reciprocating elevator.

CONVEYOR COUNTER
St. Clements Press, Ltd.—U.K. 823158.

Improvement on patent 753345 for batch delivery of newspapers, etc., from a rotary press conveyor—using an electromagnet operating a clutch with a sprocket wheel above the conveyor, which also gives good squaring up of the batch.

MINE WINDER
General Electric Company, London—U.K. 823253.

An A.C. winder arrangement for multi-deck cages, with a load measuring arrangement operating by forcing the rope across by a hydraulic piston—between the sheave and drum—when it is stationary. Patent 798760 is mentioned.

STACKER
Christian Berner A.B., of Gothenburg—U.K. 823300.

A vertical box conveyor with shafts moving in a frame and having foldable carrying members or grippers which deposit boxes on a conveyor.

SHOVEL
Mid Western Industries Inc.—U.K. 823464.

Portable excavator shovel on the rear of a wheeled vehicle, giving a wide range of swing for the boom, which can work to the rear or sides, during trenching.

OIL EXTRACTION
J. C. de Vasconcelos, of Mozambique—U.K. 823545.

Conveyorized equipment for cashew nut oil extraction, with shells broken off by steam and vacuum, with heat resisting glass plates as buckets on the conveyors during the oil extraction section.

INGOT STRIPPER
A. Motta, of Italy—U.K. 823615.

Extractor and expellor for foundry use, with articulated arms and tong-like lever pincers.

CRANE HOOK
Uddeholme A.B., of Sweden—U.K. 823664.

A hook form for travelling cranes, which carries rows of loads between clamps, held by a load, e.g. for moving bales of paper pulp—with only the outer row receiving any clamping force. Inserts are used along the row, such as plates with slots and cross bar holders.

BULK STORAGE
Blaw Knox, Ltd., Knightsbridge—U.K. 823666.

Cement and granule storage hopper—a tank with air pervious discharge at lower end, using a valve actuated by bellows and lever. The whole can be hoisted by crane, and include weighing arrangements.

FISH DRESSING
R. G. T. Baader, of Lübeck—U.K. 823698.

Device, somewhat as per patent 822[illegible]63, for cutting the heads and tails off fish, using a pair of cutters and conveyorized tippers, so that each holder tips under gravity as the head is chopped off—presenting the tail to the second cutter wheel.

PAVEMENT LAYING
C. Domenigrettli, of Milan—U.K. 823701.

A form of pavement laying and tamping, for bituminous aggregate road surfaces, including overlapping vibrating blades with crawler-powered hopper feed.

HAULER CONTROL
Maschinenfabrik Paul Pleiger, of the Ruhr—U.K. 823702.

Protective device for belt or winch haulage to avoid overheating and fire—where the fluid power supply for drive is controlled by a pressure sensitive device.

CONVEYOR SWITCH
Rapid Standard Co. Inc., of Grand Rapids—U.K. 823705.

For use with curved gravity feed track—or power-driven straight ones—where two sections back to back can flip over horizontal axis for connections.

ASSEMBLY FEED
Fisher & Ludlow, Ltd.—U.K. 823727.

Improvement on patent 819343 for factory conveyor line, using given form of D-shaped spindle for the drive actuation and disengagement part.

BISCUIT SEPARATION
Huntley & Palmer, Ltd., of Reading—U.K. 823744.

Method of overcoming inertia problem for separating biscuits at more than 2/sec, having a series of these spacing fingers on a rotating disc which temporarily slow down biscuits as they pass on the conveyor.

TILE STACKING
Goodyear Tire & Rubber Co., of Akron—U.K. 823790.

Floor tiles are stacked face to face by a tipper device which tilts pairs of tiles in succession on to a stack.

TEMPORARY BUNKER
Coal Industry Patents, Ltd.—U.K. 823863.

Arrangement to accept feed from gate conveyor when trunk or tub feed fails, using a deflector plate to feed on to or off the input or output conveyor, in the hopper.

BAND CONVEYOR
Sandvik Steel Band Conveyors, Ltd., of Birmingham—U.K. 823892.

Designed for cooling material in passage, with better heat transfer and shorter than usual, by having a coolant water flow over part of conveyor path—e.g. return section.

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